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RPO 673-38 Health Care Demand and Resources Mobilization: The Case of Peru
1988

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Health Care Demand and Resources Mobilization: The Case of Peru 673-38

FORM NO. 1889
(9-88)

WORLD BANK RESEARCH PROGRAM
COMPLETION REPORT

PROJECT'S CLOSING DATE: 12/31/87

DATE OF SUBMISSION OF COMPLETION REPORT: ~~10/31/88~~ 11/8/88

PREPARED BY: J. van der Gaag

I. PROJECT IDENTIFICATION

1. TITLE
Health Care Demand and Resources Mobilization: The Case of Peru

2. PROJECT NUMBER:	3. DEPARTMENT:	4. DIVISION:
673/38	Population & Human Resources	Welfare & Human Resources

5. STAFF PARTICIPATION:

(a) Principal Supervisor(s):* J. van der Gaag (3/85)

(b) Others Responsible:

(c) Administrative/Budgeting Officer: Brenda H. Rosa

6. CONSULTANT(S) (list names, nationalities, and affiliations):
Avi Dor. Israeli - Long-term consultant at Bank
Paul Gertler. American - Harvard School of Public Health
Ruben Suarez. Peruvian - in business on own account.

7. OTHER OUTSIDE COLLABORATOR(S) (list names, nationalities, and affiliations):
Philip Musgrove, Pan-American Health Organization.

II. DEPARTMENTAL APPROVAL

DIVISION CHIEF'S NAME (Please type):	SIGNATURE:	DATE:
J. van der Gaag		10/31/88
DEPARTMENT DIRECTOR'S NAME (Please type): Ann O. Hamilton	SIGNATURE: Ann O. Hamilton	DATE: ~~10~~ 11/4/88

* If changed indicate date(s).

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(9/88)

III. FUNDING ($ thousands)

FISCAL YEAR	RESEARCH SUPPORT BUDGET AUTHORIZATIONS			BANK		OUTSIDE		TOTAL
	Initial (1)	Supplementary (2)	Total (3) = (1) + (2)	Department (4)	Amount* (5)	Organization (6)	Amount (7)	(3) + (5) + (7)
FY 84	9.2		9.2	PHN	- 2.7			6.5
FY 85	116.0		116.0					116.0
FY 86	45.3		45.3					45.3
FY 87	11.3		11.3					11.3
FY								
TOTAL	181.8		181.8					179.1

IV. ACTUAL EXPENDITURES ($ thousands)

FISCAL YEAR	RSB PROJECT NO. 673/38 (1)	BANK* (2)	OUTSIDE (3)	TOTAL (1) + (2) + (3)
FY 84	0.4			0.4
FY 85	91.9			91.9
FY 86	19.7			19.7
FY 87	46.1			46.1
FY 88	15.2	15.1		30.3
TOTAL	178.3	15.1		193.4

APPROVED BY RESEARCH ADMINISTRATOR (print name)	SIGNATURE	DATE
Dennis de Tray	D de Tray	11/14/88

approved 12/6 [illegible]

*Do not include staff time cost equivalent in these columns.

V. OUTPUT AND DISSEMINATION

1. REPORTS - Publications and reports from project (please provide full references for each.)

Health Care Demand and Resource Mobilization (RPO 673/38)

Output
LSMS Working Paper Series

No. 35. Dor, Avi and Jacques van der Gaag. "The Demand for Medical Care in Developing Countries." May 1987.

No. 37. Dor, Avi, Luis Locay, Warren Sanderson, Paul Gertler, and Jacques van der Gaag. "Health Care Financing and the Demand for Medical Care." May 1987.

No. 31. Suarez-Berenguela, Ruben M. "Financing the Health Sector in Peru". April 1987.

No. 45. Gertler, Paul and Jacques van der Gaag. "Measuring the Willingness to Pay for Social Services in Developing Countries. May 1988.

Gertler, Paul and Jacques van der Gaag. "The Willingness to Pay for Medical Care, (book manuscript). October 1988. This has been given to the Publications Committee for review.**

LSMS No. 35 is forthcoming in the Journal of Health Economics.

LSMS No. 37 comprises two reports, one of which has been published in the Journal of Econometrics and other is forthcoming in the Journal of Health Economics.

2. DISSEMINATION - Seminars, Conferences, Training Sessions (topic, date, location, and participation).

Seminars were presented in the Bank to regional and economic staff and the papers were presented at professional conferences both in the US and in Europe.

*Indicate with asterisks the project's principal reports. Provide the Research Administrator's office with one copy of each of these reports. Additional copies may be requested if the project is later subject to evaluation by the Research Committee.

VI. OBJECTIVES AND RESULTS

In the following section, please briefly summarize the results of the project in relation to its objectives, using additional space as necessary. The narrative should be organized according to the points listed below.

1. What general questions did the study seek to answer? What answers did it find? How significant are these answers for a) development policy in general? b) Bank operations?

2. To what extent did the study fulfill its objectives? Did the objectives change as the study was undertaken? If yes, why?

This project examined the impact of user fees on the demand for health services in rural areas of two developing countries. The study looked for answers to such questions as: How would the use of health services be affected by new fee policies: Would users shift from some types of health care providers to others? Would some user groups fare better or worse than others? Would there be differences by type of health service: How much in additonal resources would be mobilized?

Some researchers have hypothesized that factors other than price, particularly perceived quality of care, dominate in household health care choices and that existing fees for public health services could be raised substantially without appreciably affecting use. To test this hypothesis it is necessary to know how price sensitive the demand for medical care is, and how this price sensitivity differs by socioeconomic group. A major part of the research has therefore been devoted to generating reliable estimates of price elasticities of demand, including the influence of non-price factors such as quality of services, costs other than fees (time and travel), health status and socioeocomic factors such as income and education.

The study used data from the Living Standards Measurement surveys conducted in Côte d'ivoire and Peru in 1985. (See RPO 673/22 and 673/26). A theoretical model was developed to explain the health care providers choice of individuals who suffered from an illness or injury. The estimation results were surprisingly similar, despite the fact that both economies have very different health care systems. Based on the estimation results, the consequences of alternative price and reinvestment policies were simulated in various settings to illustrate how rational decisions can be reached based on the trade-off between cost recovery and protecting the poor. The criteria for judging the feasibility and desirability of user fee policies were: The potential for raising revenues; changes in patterns of use of medical care; and the effects on welfare, especially for the poor.

Continued

Findings and Implications for Policy

- The demand for medical care is price sensitive, but much more so for the poor than the rich.

The revenue potential of user fees is low in poor areas, high in wealthier areas. User fees approaching the marginal costs of care will effectively price the poor out of the market, but do not substantially deter residents of wealthier villages from using medical care. Both from the point of view of cost recovery and of equity, therefore, some sort of price discrimination is necessary. Since targeting the poor for price discounts may be administratively difficult, geographic discrimination (charging lower prices for facilities that primarily serve lower-income groups) may be an answer. Fees should be introduced gradually, guided by evaluation of resulting impacts on patterns of use of medical care.

- Child care is more price elastic than adult care.

Imposing or raising user fees will harm children's health and welfare more than adult's. It would make good economic and humanitarian sense (as well as being logistically simple) to exempt child care from increases in the fee structure for medical care, or at least to differentiate between fees for child and adult health care.

- Alternative health care providers are closer substitutes than self care.

Charging fees for higher levels of care (for instance hospitals) generally causes individuals to move to other types of care rather than to drop out of the medical care market. This result suggests that it would be worth experimenting with higher charges for higher levels of care, carefully monitoring the effect on demand for medical care overall and adjusting accordingly.

The general message to policy makers is thus one of gradation and differentiation. User fees could significantly increase resources needed to improve the health system. If they are introduced selectively, and special measures are being taken to protect the poor, the policy can at the same time improve the equity of the system. But if no special measures are taken, a user fee policy will perpetuate the inequitable distribution of health care in the developing world.

The findings call for a reevaluation of the Bank's current stand on user fees for social sector financing. It is currently being scheduled that in cooperation with the PHR divisions in the regions and the other divisions in the PHR Department, workshops will be organized to draw the implications of the results for project and programs in the social sector.

The project set out to be a case study of just Peru. Unfortunately the data scheduled to be used for this project were not available on time. Fortunately LSMS data sets for both Peru and Côte d'Ivoire turned out to be rich enough to answer the main questions of this project. As a consequence we obtained results from two very different countries which facilitates the generalization of the policy conclusions. In the end we did obtain the original data set that should have formed the basis for the project. We currently are in the process of analyzing these data in the hope that they confirm as well as supplement our main findings.

673-38

THE WORLD BANK INTERNATIONAL FINANCE CORPORATION

OFFICE MEMORANDUM

DATE August 6, 1987

TO Mrs. Sonia Lee

FROM Ma. Vilma V. Mataac, PPRRA
Ma. Vilma V. Mataac

EXTENSION 31030

SUBJECT FY88 Budget Distribution

The enclosed list is the Fiscal Year 1988 budget distribution of the RSB-Funded Research Projects. Kindly transfer the budgeted amount to the consultant fees category for each project.

cc: Mrs. P. A. Plesch

P-1866

Record Removal Notice

File Title	Barcode No.
Health Care Demand and Resources Mobilization: The Case of Peru (RPO 673-38) / van der Gaag - 1v	1268658

Document Date	Document Type
August 6, 1987	Attachment

Correspondents / Participants

Subject / Title
FY88 Budget Distribution

Exception(s)
Corporate Administrative Matters

Additional Comments

The item(s) identified above has/have been removed in accordance with The World Bank Policy on Access to Information or other disclosure policies of the World Bank Group.

Withdrawn by	Date
Shiri Alon	June 20, 2023

OFFICE MEMC ;ANDUM

DATE June 2, 1987

TO Mr. S. Panickaveetil, PBDBP

FROM Ma. Vilma V. Mataac, VPERS

EXTENSION 33487

SUBJECT Corrections on Closure of Accounts of RSB-Funded Projects

Several RSB-funded projects were granted extensions of the closing date by REPAC. Therefore these projects' accounts should be closed accordingly.

I would appreciate if you could update the changes in your Master Organization Codes as per the list enclosed.

Enclosure

cc: Mmes. P. A. Plesch, VPERS
S. C. Lee, ACTBC
M. Tonson, PBDBP

RSB-Funded Projects Closed by REPAC

Date: -Jun-87

Project Number	Short Title	Principal Supervisor	Resp Dept	Project Closed by REPAC	Account to be Closed
67304	CASE STUDY AFRICAN AGRIC DEV	U. LELE	DRD	30-Jun-88	31-Dec-88
67338	HEALTH CARE DEMAND: PERU	J. VAN DER GAAG	DRD	31-Dec-87	30-Jun-88
67344	TREE CROP DEV. & SUPPORT PROGRAMS	T. BERTRAND	AGR	31-Aug-87	28-Feb-88
67352	THE FRONTIERS OF ECONOMICS	B. FITZGERALD	CPD	30-Jun-88	31-Dec-88
67383	STRCTRL ADJ NEWLY INDUSTRIALIZED COUNTRY: KOREA	V. CORBO	DRD	30-Nov-87	30-May-88
67361	RESEARCH OBSERVER	H. CORTES	VPERS		

Note: The closing of accounts of the above projects has to be corrected.

THE WORLD BANK/INTERNATION FINANCE CORPORATION

OFFICE MEMORANDUM

DATE February 13, 1987

TO Mr. Jacques van der Gaag, DRDLS

FROM Phi Anh Plesch, Secretary, REPAC PAP

EXTENSION 33484

SUBJECT RPO 673-38: Health Care Demand and Resource Mobilization: The Case of Peru

Given the exceptional circumstances which have caused delay in the completion of your research project, RPO 673-38, your request for a nine-month extension of that project has been granted by the Chairman of REPAC. The closing date of RPO 673-38 is now set at December 31, 1987.

PAP/ea

cc: Messrs. G. Ingram, D. de Tray, J. Lowther, DRDDR
Ms. V. Mataac, VPERS

THE WORLD BANK/INTERNATIONAL FINANCE CORPORATION

OFFICE MEMORANDUM

File 673-38

DATE: February 11, 1987

TO: Deepak Lal, VPERS

FROM: Jacques van der Gaag, DRDLS

EXTENSION: 33478

SUBJECT: **RPO 673/38, Health Care Demand and Resource Mobilization; The Case of Peru**

1. Being a firm believer in the virtue of delivering my products on time, I regret to have to ask you for a 9 months extension of RPO 673/38, **Health Care Demand and Resource Mobilization; The Case of Peru.**

2. Instituto Nacional de Estadistica (INE) was responsible for collecting the household survey data needed for the project and for the preparation of a clean tape. USAID had funded the survey work. PAHO and a group of researchers at Stony Brook (also funded by USAID) were participants.

3. Due to a financial conflict between the Ministry of Health and INE (regarding money from a World Bank health loan, unrelated to the project), INE decided to hold the tape hostage untill "The Bank" (i.e. PHN, not ERS, though the difference may have escaped INE's attention) instructed the Ministry of Health to provide the funds INE expected. Unfortunately, The Bank was quite willing to do so, but the problem was with the new Minister of Health. PAHO and USAID were instructed by INE not to provide "The Bank" with a copy of the tape.

4. We had anticipated to obtain the data by September 1985. We managed to obtain a pirated copy by Spring 1986. Shortly after the matter was settled formally.

5. Because of this delay I request a 9 months extension for this RPO, putting the completion date at December 31, 1987. All funds of the RPO have been committed. There are no cost consequences (for REPAC) because of this extension.

Pls file,

OK, given the exceptional circumstances
Deepak

cc: Gregory K. Ingram, DRDDR
Dennis de Tray, DRDDR

673-38

THE WORLD BANK INTERNATIONAL FINANCE CORPORATION

OFFICE MEMORANDUM

DATE January 30, 1987

TO Mrs. Pilar San Jose, ACTBC
Mr. S. Panickaveetil, PBDBP

FROM Ma. Vilma V. Mataac, VPERS

EXTENSION 33487

SUBJECT Closure of Accounts of RSB-Funded Projects

I am sending to your respective offices a list of research projects which will soon be closed by REPAC along with two dates:

1) the date of the closing of the project after which no new commitments can be made against the project;

2) the date of the closing of the project's account after which no disbursements would be authorized.

I have marked those projects whose dates have to be corrected due to withheld budget while waiting for final expenditures against accruals.

The list contains projects whose accounts (or master organization codes) should be closed accordingly.

Attachment

cc: Mmes. P. A. Plesch, VPERS
M. Tonson, PBDBP
K. Hanneman, ACTBC

Project Number	Short Title	Principal Supervisor	Resp Dept	Project Closed by REPAC	Account to be Closed
67365	MONE & FISCAL POL & FINANCE INST	M. SCHRENK	CPD	31-Dec-86	30-Jun-87
67341	CAPITAL MARKET REGULATION	S. RAJAPATIRANA	VPERS	01-Jan-87	02-Jul-87
67338	HEALTH CARE DEMAND: PERU	J. VAN DER GAAG	DRD	31-Mar-87	30-Sep-87
67372	INTL COMP REAL PUTPUT LEVELS IN MANUFATURING	S. AHMAD	EPD	30-Mar-87	30-Sep-87
67385	PUBLIC ENTERPRISES DEFICITS SUB AFRICA	M. SHIRLEY	PPD	30-Mar-87	30-Sep-87
67344	TREE CROP DEV. & SUPPORT PROGRAMS	T. BERTRAND	AGR	28-Feb-87	30-Aug-87
67230	PROD AND DISTR EFFECTS - DAIRY DEV PROJS	R. SLADE	ASP	30-Jun-86	31-Mar-87
67242	DETERMINANTS OF FERTILITY-EGYPT	S. COCHRANE	AEP	31-Dec-85	31-Mar-87
67265	COFFEE BOOM IN EAST AFRICA	D. GREENE	EA1	30-Jun-86	31-Mar-87
67334	GROWTH IN SUB-SAHARAN AFRICA - PHASE II	A. NOMAN	WANVP	30-Jun-86	31-Mar-87
67337	EUROPEAN TRADE POLICIES AND THE SOUTH	M. FINGER	DRD	30-Jun-86	31-Mar-87
67376	COMPARATIVE EDICATIONAL POLICIES IN AFRICA	G. PSACHAROPOULOS	EDT	30-Jun-86	31-Mar-87

THE WORLD BANK / INTERNATIONAL FINANCE CORPORATION

OFFICE MEMORANDUM

cc DH
JL
AK FJ
VM
file 673-38

DATE: March 7, 1985

TO: Mrs. Phi Anh Plesch

FROM: Jacques van der Gaag, DRDLS
David de Ferranti, PHN

EXT.: 61235

SUBJECT: Peru Health Project, RPO 673-38

1. As discussed with you by telephone on February 26, van der Gaag will be taking over as Principal Investigator for this project, effective immediately. De Ferranti will have no further formal role in the future. Please change your records accordingly.

2. De Ferranti is withdrawing because he will soon be moving to a new job in the Bank, where his duties will preclude spending time on this project.

3. Van der Gaag has been involved from the start and knows all of the details about the project. No change of direction or loss of time is expected. Van der Gaag's recent transfer from DRDEI to DRDLS will enable him to spend more time on the project than previously.

4. Please call on us if you need additional information.

cc and cleared: Ms. Nancy Birdsall, PHNPR
Mr. Dennis De Tray, DRDLS

Record Removal Notice

File Title
Health Care Demand and Resources Mobilization: The Case of Peru (RPO 673-38) / van der Gaag - 1v

Barcode No.
1268658

Document Date
November 20, 1984

Document Type
Form

Correspondents / Participants
To: Programming & Budgeting Division, PAB
From: David de Ferranti, Acting Chief, PHNPR

Subject / Title
Budget Transfer Request

Exception(s)
Corporate Administrative Matters

Additional Comments

The item(s) identified above has/have been removed in accordance with The World Bank Policy on Access to Information or other disclosure policies of the World Bank Group.

Withdrawn by	Date
Shiri Alon	June 22, 2023

Record Removal Notice

File Title	Barcode No.
Health Care Demand and Resources Mobilization: The Case of Peru (RPO 673-38) / van der Gaag - 1v	1268658

Document Date	Document Type
April 12, 1984	Letter

Correspondents / Participants
To: Ms. Sheila Wilkerson, The World Bank
From: Gary S. Fields, Consulting Economist

Subject / Title
Consultancy performed for Dr. George Psacharopoulos of the World Bank

Exception(s)
Personal Information

Additional Comments

The item(s) identified above has/have been removed in accordance with The World Bank Policy on Access to Information or other disclosure policies of the World Bank Group.

Withdrawn by	Date
Shiri Alon	June 22, 2023

673-38

THE WORLD BANK INTERNATIONAL [illegible]ANCE CORPORATION

OFFICE MEMORANDUM

CONFIDENTIAL

DATE April 23, 1984

TO REPAC Members

FROM Phi Anh Plesch PAP

EXTENSION 69013

SUBJECT Minutes of REPAC Meeting of April 10, 1984

The Research Projects Approval Committee met on April 10, 1984. Members present were Messrs. Lal, Chairman, Choksi, Dervis, De Tray, O'Brien, Selowsky, Tidrick and Ms. Lele. Mr. Pfeffermann did not attend.

Annual Report to the Board on the World Bank Research Program

Ms. S. Blinco, consultant editor in VPERS, briefed REPAC members on the content and issues in the preparation of the next annual report on the World Bank research program, tentatively scheduled for Board discussion in December 1984. The report will have to cover all research activities (both departmentally-funded and ERB-funded) during FY84. In addition to a detailed account of budgetary allocations, the report usually contains a summary of evaluations of projects completed during the year, and a description of the research portfolio. Apart from these usual features, the more substantive part of the report would be devoted to selected themes such as shifts in research priorities, reorganization of research management, etc. Ms. Blinco reminded the members that Board's growing expectations were for a more output-oriented type of report. This would entail greater emphasis on the evaluation of the output and impact of the research program or part of it. She noted that this work had yet to start. The Chairman stated that the subject of evaluation would be taken up at next month's meeting of REPAC.

Ms. Blinco proceeded then to describe the production process and who should be involved in it. Financial data are provided by PBD. Description of ongoing individual research projects (both ERB and departmentally-funded) are given by research supervisors and departments. The main responsibility for writing the report rests with the Research Administrator, assisted by his staff and by a task force, at the discretion of research management. 1/ The clearance process

1/ Two years ago, the task force was appointed by the Vice President, ERS and included: Messrs. E. Stoutjesdijk, chairman, S. Burki, M. Selowsky, H. van der Tak, and J. Wood. Last year, the task force was appointed by the Senior Research Adviser, and included Messrs. K. Dervis, M. Selowsky, and Ms. P. San Jose (PBD).

would involve REPAC, Department Directors, Vice Presidents (ERS, OPS, EIS and Regions), RPC, and Managing Committee. The report then is sent to the President for signature, then to the print shop and finally to Board members about a month before Board discussions. She noted that the production time between the first draft of the report to the grey cover report ready for delivery to the Board is about 12 weeks. Therefore, the first draft should be ready at the latest by end of July-beginning of August. The Chairman agreed with the schedule and announced that he would appoint a task force in the next two weeks to commence work soon thereafter.

Research Proposal: Labor Market Performance and Policies for Labor Absorption in Thailand

Mr. Choksi introduced this proposal noting that it had been reviewed by a panel of five Bank staff, in addition to two external referees. Following a formal meeting with the sponsors, panel members were asked to send their individual comments to him which were also circulated to all REPAC members. He said that this proposal raised several important concerns: (i) all the proposed activities did not fit well together because of a lack of a solid and well articulated analytical framework. While he saw some potential high pay-off from the urban labor market and migration components, he viewed the rural labor market and the macro-modelling components as analytically very weak and doubtful; (ii) resources would be spread too thin over the various proposed activities and (iii) the time allocated to the research by the principal Bank researchers was highly inadequate. In view of these concerns he recommended that the proposal not be funded. However he would encourage the resubmission of the urban labor market and migration components provided the researchers can elaborate on the analytical techniques, justify the choice of Thailand as a good country study, explain what policy implications they expect from the exercise, and make a clear presentation of the budget, Bank staff time, the identity of the Thai collaborators and their time input.

REPAC members agreed with these conclusions and recommendations. It was indeed pointed out that the rural labor market study would require a separate major research proposal to be developed, if need justifies it. And members shared the doubts that a new SAM with focus on employment is either feasible or useful. To them the urban labor market and migration studies seemed the most promising. However, on the issue of resubmission some members queried whether there should be any linkages with the forthcoming multi-country comparative study on wages and labor markets. Mr. Choksi suggested that, because of the apparent urgency of the Thai study, decisions on the proposal, if resubmitted, should be made independently of the larger comparative study.

REPAC voted to recommend (i) not to approve the proposal; (ii) to allow the sponsors to resubmit the urban labor market and migration components. The sponsors will be made aware of the existence of rule K ("External Collaborators") of REPAC's newly published rules and procedures and (iii) to ask the sponsors not to resubmit neither the rural labor market component nor the macro-modelling component.

Research Proposal: Food Policy Stochastic-Dynamic Analysis

This proposal was introduced by Mr. Selowsky who reported that all the reviewers were generally negative about it, except for one who was lukewarm but had great doubts about the simulation approach. Mr. Selowsky expressed the subcommittee's concern that analytically the project appeared too difficult and ambitious. The methodology for the proposed extension of the dynamic stochastic model into a general equilibrium one was thought inadequate because of the unsatisfactory treatment of some key specifications, such as farmers price expectations, savings and investment behaviour of individuals, private stocking behaviour, the treatment of the risk factor, and the impact of changes in production. The proposal requires a vast amount of simulations which, besides being difficult and costly, are not certain to generate substantial insights into the complex issues of food security. He would favor a less ambitious and more targetted approach, concentrating on a few key questions and perhaps in smaller and less complex contexts than India. REPAC members agreed that instead of methodology development the sponsor might want to consider the application of existing models. Mr. Selowsky then mentioned a forthcoming proposal from ASP for an application-cum-dissemination of an earlier static version of the India agricultural sector model which in his views would be preferable to the present proposal. This of course, he noted, raised the issue of heavy concentration of agricultural research on India.

Given the concerns on the methodology, in view of the heavy concentration of agricultural research on India, and after weighing the costs and benefits of this study, REPAC members agreed to recommend neither to approve the proposal nor to encourage its resubmission.

Data Collection and Analysis Issue

Before taking up the two other research proposals left in the agenda, Mr. Lal raised an important issue which seemed to recur more often than not. He noted that three proposals currently under consideration by REPAC seemed each to have been built around an existing large data set collected under and financed by a Bank project loan. He asked whether there should be any presumption that the analysis of these data sets should be done in-house instead of outside. Secondly he wondered whether resources needed to analyze these data should not have been also built-in in the project loan.

A member offered her personal views based on her experience both as a project officer in an operational division and as a research manager. According to her, operational staff is too hard-pressed to have time for analytical work. On the other hand, when data collection is "forced down the throat" of borrowing countries as a condition for project lending, chances are that they give little importance to these data once they are collected. Yet most likely they do not want the Bank or other expatriates to have access to these data except under their terms. In her view, the Bank has larger responsibilities in providing intellectual leadership and therefore the necessary resources for the analysis of these data.

It was pointed out that if money for data analysis were built-in ex ante in the project loan along with data collection, the Bank is unlikely to be able to exercise any control over such analysis.

Mr. Lal suggested that the question of collecting and analyzing large data sets might be a question worth raising with the Research Policy Council. It was agreed that he should appoint a task force to write a background paper on these issues for the RPC.

As to whether the analysis of existing data sets should be done in-house or by outside institutions, a member argued that most likely, in nine out of ten cases, Bank researchers have greater comparative advantage in doing it, because of their closer operational links and their greater leverage in getting access to these data.

Research Proposal: School Quality and Educational Outcomes in Rural Brazil

In introducing this proposal, Mr. De Tray emphasized the unique character of the data sets on which the study will be based. He said that technically the project was judged acceptable, although he felt that, in the description of the methodology, some potential econometric difficulties might be overlooked by the researchers. His main concern was however with the budget: he felt that the resources requested to build Northern Brazil's research capacity were excessive compared to funds necessary to carry out the research. REPAC members unanimously shared that concern. They agreed that the issues to be addressed were interesting, that the proposal was technically sound, but they did not think that it was worth putting $400,000 in it. After spending a great deal of time figuring out how to cut down on the institution-building component of the budget, they decided that an allocation of $225,000 to the project would be reasonable, especially in view of ERB constraints. Flexibility would be left to the research sponsor to allocate these $225,000, (sharply reduced from the original request of $386,000) among the various components of their project. REPAC's recommendations to the Vice President, ERS, were therefore to approve this proposal with two provisos: (i) the research team hire an econometrician or education production expert to work on the project and (ii) $225,000 only be authorized for the project. This figure would include the $3,300 already advanced last month to cover the salary and related benefits of Dr. J. Armitage in Brazil for the month of April.

Research Proposal: Health Care Demand and Resource Mobilization: The Case of Peru

Mr. Lal introduced this proposal which he and Mr. Selowsky have extensively discussed with the sponsors. He reported that the subcommittee had a few doubts about the pay-off of this research and the conclusiveness of its findings. Firstly it was not persuaded that the important policy issues concerning cost-recovery in health programs could be simply answered by an improved demand curve for health in one country. Secondly it questioned the lack of any objective data on health status, which make it difficult to put any welfare economic interpretation of the demand equations. And thirdly it was sceptical that the provider survey would yield any conclusive evidence on the relative benefits of alternative forms of health provision. However, Mr. Lal noted that the external referees were rather enthusiastic about the project, mainly because of its potential contribution to improved knowledge on important issues in health economics, given the opportunity offered by the rich household survey data. In spite of some minor criticisms on the analytical design, Mr. Lal said that the referees overall found the methodology appropriate. The subcommittee thus felt that it could recommend approval of the proposal provided the budget be reduced possibly by deleting the provider survey. At the subcommittee's request, the sponsors reluctantly scaled down their budget to $181,800, a reduction which they said could affect their collaborative effort with the Peruvian institution, and their proposed dissemination activities.

In the ensuing discussions, Committee members were satisfied that this research is filling a gap and that its operational and policy relevance is reflected in that donor and technical agencies as well as Bank operational staff are expecting guidance on the important issues of cost recovery in the health sector. A member also argued convincingly in favor of the provider survey, mostly because of the important issue of the choice between different types of providers, and the factors determining that choice.

REPAC is therefore recommending approval of an and allocation of $181,800 to this proposal.

cc. and cleared with: Mr. D. Lal

PAP:lt

THE WORLD BANK/INTERNATIONAL FIN CE CORPORATION

OFFICE MEMORANDUM

CONFIDENTIAL

DECLASSIFIED
JUN 20 2023
WBG ARCHIVES

DATE April 23, 1984

TO REPAC Members

FROM Phi Anh Plesch PAP

EXTENSION 69013

SUBJECT Minutes of REPAC Meeting of April 10, 1984

Research Proposal: Health Care Demand and Resource Mobilization: The Case of Peru

Mr. Lal introduced this proposal which he and Mr. Selowsky have extensively discussed with the sponsors. He reported that the subcommittee had a few doubts about the pay-off of this research and the conclusiveness of its findings. Firstly it was not persuaded that the important policy issues concerning cost-recovery in health programs could be simply answered by an improved demand curve for health in one country. Secondly it questioned the lack of any objective data on health status, which make it difficult to put any welfare economic interpretation of the demand equations. And thirdly it was sceptical that the provider survey would yield any conclusive evidence on the relative benefits of alternative forms of health provision. However, Mr. Lal noted that the external referees were rather enthusiastic about the project, mainly because of its potential contribution to improved knowledge on important issues in health economics, given the opportunity offered by the rich household survey data. In spite of some minor criticisms on the analytical design, Mr. Lal said that the referees overall found the methodology appropriate. The subcommittee thus felt that it could recommend approval of the proposal provided the budget be reduced possibly by deleting the provider survey. At the subcommittee's request, the sponsors reluctantly scaled down their budget to $181,800, a reduction which they said could affect their collaborative effort with the Peruvian institution, and their proposed dissemination activities.

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REPAC is therefore recommending approval of an and allocation of $181,800 to this proposal.

"Health Care Demand and Resource Mobilization: The Case of Peru"

The proposal on "Health Care Demand and Resource Mobilization: The Case of Peru" addresses an important policy issue for the Bank, and LDCs, definesits objectives with admirable clarity, and reasons the case well for the add-on collection of health provider data to increase the utility of the large U.S. A.I.D. funded health survey in Peru. The only problem I would note is in the brief section on empirical estimation methododology (pp. 25-28), where some critical questions are not raised and hence left unanswered. Misleading policy conclusions could be drawn if these methods were not amended in the analysis phase.

(1) If the three equations are to be estimated at the top of page 25 of the proposal determining whether health care is demanded (D), how much is demanded (HC), and health status (H), the endogenous variables (on the right side of these equations) determining these outcomes must somehow be identified. The choice of identification restrictions will determine whether the proposed empirical exercise is meaningful. For example, som exogenous variable in the H equation must be excluded from the D equation, if one is to be able to estimate consistently the effect of Health Status (H) on the dema for health care (D). This is implicitly the problem discussed on p. 23, but no satisfactory strategy has been proposed in the health care literature on how to include health status (H) as a determinant of health demands (D), since the errors or unexplained disturbances in H will be serially correlated due to the stock-like character of health "capital." The data being collected here are particularly unsuitable for disentangling this causal effect, since the data will be only retrospective, and not prospective in nature (top p. 29).

If the conditioning socioeconomic variables from the household, X_1, the local environment, X_2, and prices and costs of medical inputs, X_3, describe the systematic determinants of health status, a reduced form equation for health status (H) should be readily estimated by ordinary least squares or single stage qualitative choice models, (e.g. logit, probit, etc.). Such an equation provides the essential information for a policymaker to infer how much difference the provision and pricing of medical services makes for health status of a representative person (efficiency) or members of various socioeconomic groups (distributional consequences).

Similarly, the discrete and continuous measures of the demand for health services (D and HC) can also be estimated consistently as a function of X_1, X_2, and X_3. These reduced-form equations are also defensible. However, these reduced form estimates depend on the assumption that the provision of medical inputs (locality prices and programs in X_3) are uncorrelated with the exogenous health endowments or initial health status of the population. If instead, the medical inputs (e.g. public health clinics) are placed in those regions that have, say, the worst health environment for reasons that are not measured by X_1, X_2, or X_3, then the "true" health status benefits of the clinic inputs might be underestimated. This possible source of bias in estimating reduced form equations cannot be dismissed, but the bias due to this source is likely to be less serious than that generated by introducing the endogenous health status (H) directly into the input demand equations (D and HC), in my judgment. Moreover, the inclusion of HC as an explanation of health status (H) is even more difficult to interpret even if some basis for identification is proposed. This health status function is analogous to estimating a reduced form equation incorporating both production technology and health care demand behavior conditioned on local prices, endowments and technological constraints included in X_1, X_2, X_3, plus health care demands for some of the inputs (HC). It is hard for me to know what a price effect of health care service $\partial H/\partial X_3$ on health status (H) would mean, when it is estimated from the third equation on p. 25 that is also conditioned on the actual (or predicted) use of that form of health care (HC).

All of this discussion is to suggest that reduced form equations in the X's determining D, HC and even H can be estimated from the Peruvian Survey and the additional health provider survey. This will provide policymakers with better estimates of health care demand and status effects of health policy alternatives than we currently have for other populations. This will be a substantial advance for the field. If the research staff attached to this project are innovative they may see some way to model the dynamics of health status changes over time in response to changing provision of health care and changing prices of that care. But the Peruvian data base, rich as it promises to be, is not particularly suitable to this task since it is not a panel survey. Care in collecting the health provider information and local price data retrospectively could open the door to this line of analysis, but I am not sure that the basic survey collected retrospective detail on health status in previous years. Nonetheless, with a strong microeconometric student of health economics, the proposed data should provide us with important estimates to test the hypotheses regarding how time prices, market prices, user fees, and provider quality influence health care utilization and the pattern of mortality and morbidity in a diverse country such as Peru. This outcome of the project fully justifies the associated budget. But obtain the best possible analysts to participate in the project, not a promising pre-Ph.d.

Attachment 2

Research Proposal on "Health Care Demand and Resource Mobilization: The Case of Peru"

I have reviewed this research proposal and on balance find it an interesting and worthwhile project that should be supported. I believe its objectives are reasonably well-defined and that it accurately takes account of the most recent research in this area. It should further enhance our knowledge on the responsiveness of the demand for health to the effects of monetary and time price variations, based on surveys where these questions are central rather than incidental by-products.

The study appears to be adequately designed to deal with most of the issues raised, though one must note that it is very difficult indeed to fully design a survey that allows one to estimate accurate demand elasticities for health services. In the absence of the actual survey instruments or of data on the way in which it will be implemented, it is not possible for me to determine the precise way in which the household survey will capture the quantity and character of the health service utilization experiences of households, nor of the underlying health conditions that prompted such utilization. This makes it difficult to assess the kind of logical leaps that will be required in specifying the econometric model to make inferences on the determinants of demand. Similarly, without knowledge of the time period over which households are being asked to recall the experiences of themselves and of members of their families with the cost and utilization of specific health services or of their health status, it is also difficult to assess the likely quality of the survey data being collected. The research proposal suggests that the relevant data are being collected and hopefully this is the case. The proposal's theoretical model builds on earlier work and, at the level at which it is presented in the proposal, appears appropriate.

The one important issue which does not appear to be addressed in the proposal is the cost of collection of user charges for different types of health facilities. There are many who assert, perhaps on the basis of little evidence, that the cost of collection (inclusive of corruption and mismanagement factors), as a percentage of gross revenue intake, is quite high, particularly for small scale health units. If this is the case, there may be a tendency to overstate the likely revenue implications of increased charges for health services, with possible adverse implications for health services demand. Would it be possible to delve into this question in the provider survey, at least for those institutions already levying charges for services?

I have some additional specific points which are listed below:

Page 8, second para.: Another quality indicator, at least in terms of perceived quality, might be the identification of who delivers the health service, a doctor or a paramedic.

Page 9, second para.: It is the health status at the time of utilization that is usually germane to the character of utilization--deriving data on this usually is highly sensitive to how far back one has to recall this information.

Page 20, first para.: While the sample size is clearly adequate to estimate reasonable demand equations, it is not clear that it will be adequate for estimating demand equations for each of the 15 districts. It is also important that estimates of money price elasticity be estimated, subject to the conditions prevailing with respect to the time and transport costs of utilization.

Page 26, first para.: It is unclear how the dependent variables of the equations measuring health consumption will be specified.

Page 26, third para.: It appears that nutritional status will be proxied by income--is this correct?

Pages 26-28: The proposal seems to suggest that the analysis will be carried out separately for various socio-economic groups; I assume this includes separating out the demand for dependent and nondependent members of households. Will the survey be carried out in such a way that the respondent(s) to the questionnaire will be able to provide accurate information on the health status and the costs and characteristics of utilization of the relevant household members for their particular experiences of health services utilization during the relevant period of recall?

THE WORLD BANK/INTERNATIONAL FINANCE CORPORATION

OFFICE MEMORANDUM

APR 17 1984

DATE April 16, 1984

TO Mrs. Anne O. Krueger

FROM Phi Anh Plesch PAP

EXTENSION 69013

SUBJECT Research Proposal: "Health Care Demand and Resource Mobilization: The Case of Peru"

REPAC considered this proposal at its meeting on April 10, 1984.

The objective of the proposed study is to develop improved information and methods to assist policymakers and Bank operational staff in addressing the issues of cost recovery, the role of user charges and resource allocation in the context of the health sector. The study will be based on a large ongoing household survey which is being co-funded by AID, the German development assistance agency and the health ministry of Peru (aided by a Bank health project loan) at a tune of $1.1 million. The request from ERB, totalling $229,500, is for funding the analysis of that household survey data focussing on household and individual demand for health care, and for a partial funding of a health provider survey ($50,000) which will help address the issues of cost and productivity from the supply side. The provider survey is also expected to be co-financed by various donor agencies.

The proposal was reviewed by Mr. P. Heller and Professor P. Schultz and by a subcommittee consisting of Deepak Lal and Marcelo Selowsky which met and discussed the proposal with the sponsors. Both external reviewers were strongly supportive of the project. The subcommittee had a few doubts about the pay-off of this research and the conclusiveness of its findings. Firstly it was not persuaded that the important policy issues concerning cost-recovery in health programs could be simply answered by an improved demand curve for health in one country. Secondly it questioned the lack of any objective data on health status, which make it difficult to put any welfare economic interpretation of the demand equations. And thirdly it was sceptical that the provider survey would yield any conclusive evidence on the relative benefits of alternative forms of health provision. However, the external referees were rather enthusiastic about the project, mainly because of its potential contribution to improved knowledge on important issues in health economics, given the opportunity offered by the rich household survey data. In spite of some minor criticisms on the analytical design, overall they found the methodology appropriate. The subcommittee thus felt that it could recommend approval of the proposal provided the budget be reduced possibly by deleting the provider survey. At the subcommittee's request, the sponsors reluctantly scaled down their budget to $181,800, a reduction which they said could affect their collaborative effort with the Peruvian institution, and their proposed dissemination activities. At REPAC's discussions, members were satisfied that this research is filling a gap and that its operational and policy relevance is reflected in that donor and technical agencies as well as Bank operational staff are expecting guidance on the important issues of cost recovery in the health sector. A member also argued convincingly in favor of the provider survey, mostly because of the important issue of the choice between different types of providers, and the factors determining that choice. Therefore REPAC is recommending approval of and an allocation of $181,800 to this proposal.

cc. and cleared with: Mr. D. Lal   ok Lal

PAP:lt

THE WORLD BANK/INTERNATIONAL FINANCE CORPORATION

OFFICE MEMORANDUM

272

DATE: April 12, 1984

APR 13 1984

TO: Mrs. Anne O. Krueger

FROM: Phi Anh Plesch PAP

EXTENSION: 69013

SUBJECT: Research Proposal: "Health Care Demand and Resource Mobilization: The Case of Peru"

REPAC considered this proposal at its meeting on April 10, 1984.

The proposal was reviewed by Mr. P. Heller and Professor P. Schultz and by a subcommittee consisting of Deepak Lal and Marcelo Selowsky which met and discussed the proposal with the sponsors. Both external reviewers were strongly supportive of the project. The subcommittee had a few doubts about the pay-off of this research and the conclusiveness of its findings. However, given the favorable reviews by the external referees, it felt that the proposal should be approved but at a reduced budget. At the sub-committee's request, the sponsors have resubmitted a scaled-down budget of $181,800 (instead of the original $229,500). At REPAC's discussions, the point was further made that this research may be useful in helping guide policymakers and other persons from donor and technical agencies (e.g. WHO, PAHO, USAID, European aid agencies, etc.) on the important issues of cost recovery and user charges in the health sector. Therefore, REPAC is recommending approval of and an allocation of $181,800 to this project.

cc. and cleared with: Mr. D. Lal

PAP:lt

Not enough info on the basis of which to approve

P-1866

OFFICE MEMORANDUM

DATE April 19, 1984

TO Messrs. J. North, PHN
G. Ingram, DRD

FROM Deepak Lal, Chairman, REPAC

EXTENSION 61031

SUBJECT Decision Memo on: "Health Care Demand and Resource Mobilization: The Case of Peru"

1. The above proposal was considered by the Research Projects Approval Committee at its meeting on April 10, 1984. The Committee's recommendations were to approve the proposal, but at the reduced budget of $181,800 as amended by the sponsors in their April 9, 1984 memo. These recommendations were endorsed by the Vice President, Economics and Research.

2. The project identification code and financial authorizations are as follows:

(i)	Identification Code:	673-38
(ii)	FY84 Authorization	$9,200
(iii)	FY85 Authorization	$116,000
(iv)	FY86 Authorization	$45,300
(v)	FY87 Authorization	$11,300
(vi)	Total Authorization	$181,800

3. Please use the identification code in all financial documents and other communications concerning the project, including letters of appointment to consultants.

4. While the project is a joint one between the two departments (PHN and DRD), I understand that PHN is responsible for its financial management.

5. Excerpts from the referees' reports will be sent to you and the research sponsors separately.

cc: Messrs. D. de Ferranti, J. Warford, Ms. A. Fullerton (PHN)
J. van der Gaag, T. King, J. Lowther (DRD)
A. Bararia, Ms. K. Herat (PBD)
W. Casson, Ms. Y. Rodrigo (ACT)
Mmes. S. Blinco, B. Lewis, P.A. Plesch (VPERS)
REPAC Members

PAP:lt

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File Title	Barcode No.
Health Care Demand and Resources Mobilization: The Case of Peru (RPO 673-38) / van der Gaag - 1v	1268658

Document Date	Document Type
April 9, 1984	Memorandum

Correspondents / Participants
To: Mr. Dipak Lal
From: Jacques van der Gaag (DRDEI), David de Ferranti (PHNPR)

Subject / Title
Budget Adjustment Reseach Proposal on Health Care Demand - Demand and Resource Mobilization: the Case of Peru

Exception(s)
Personal Information

Corporate Administrative Matters

Additional Comments

The item(s) identified above has/have been removed in accordance with The World Bank Policy on Access to Information or other disclosure policies of the World Bank Group.

Withdrawn by	Date
Shiri Alon	June 22, 2023

THE WORLD BANK / INTERNATIONAL FINANCE CORPORATION

OFFICE MEMORANDUM

DATE April 9, 1984

TO REPAC Members

FROM M. Selowsky, D. Lal
M.S.

EXTENSION 76153/61031

SUBJECT Health Care Demand and Resource Mobilization: The Case of Peru

The above subcommittee of REPAC reviewed this proposal with the sponsors Messrs. De Ferranti and van der Gaag. Both the external reviewers have reported favorably on the proposal.

The following doubts were expressed by the subcommittee:

(i) However interesting and unique the data set available for analysis, the costs of the latter did seem to be large relative to the expected benefits in terms of policy advice. It was doubtful whether one more set of parameter estimates of the demand curve for health in one country would in itself be persuasive in clinching the important policy issues concerning cost-recovery in health programs;

(ii) As there were no objective measures of health status in the survey data already collected (except for the case of infant mortality), it would be difficult to provide a welfare economic interpretation of the econometrically estimated demand functions;

(iii) This also meant that the provider survey, supposedly to provide data on the supply side of the health market (in particular of its quality) would not be able to provide hard evidence on the relative (objective) benefits of alternative forms of health provision.

The subcommittee suggested various alternatives to the project sponsors to enable the analysis of the existing survey data to be carried out, including giving away the data to any interested researchers outside the Bank. The sponsors argued that no outside researchers would be able to do the analysis without obtaining budgetary resources of the magnitude being asked for in the proposal. Given the strong support for the project by the external referees, the subcommittee felt that if the sponsors could come up with a reduced budget, possibly excluding the provider survey, the project should be approved.

DL:lt

THE WORLD BANK/INTERNATIONAL FINANCE CORPORATION

OFFICE MEMORANDUM

Cecilia
Please file

DATE April 5, 1984

TO Mr. D. Lal, DRDDR

FROM Marcelo Selowsky, OPSVP M.S.

EXTENSION 7-6153

SUBJECT Health Care Demand - Research Proposal

1. I just received the second referee report on this proposal. Both referees - which in my view are among the few people who have done work in this area - are quite positive about this research. I suggest for REPAC to approve the proposal.

2. The referees make some important suggestions that should be taken into account. I suggest to attach these comments in REPAC's recommendation.

Office Memorandum

April 5, 1984

To: Mrs. Plesch (IBRD)

From: Peter S. Heller PH

Subject: Research Proposal on "Health Care Demand and Resource Mobilization: The Case of Peru"

I have reviewed this research proposal and on balance find it an interesting and worthwhile project that should be supported. I believe its objectives are reasonably well-defined and that it accurately takes account of the most recent research in this area. It should further enhance our knowledge on the responsiveness of the demand for health to the effects of monetary and time price variations, based on surveys where these questions are central rather than incidental by-products.

The study appears to be adequately designed to deal with most of the issues raised, though one must note that it is very difficult indeed to fully design a survey that allows one to estimate accurate demand elasticities for health services. In the absence of the actual survey instruments or of data on the way in which it will be implemented, it is not possible for me to determine the precise way in which the household survey will capture the quantity and character of the health service utilization experiences of households, nor of the underlying health conditions that prompted such utilization. This makes it difficult to assess the kind of logical leaps that will be required in specifying the econometric model to make inferences on the determinants of demand. Similarly, without knowledge of the time period over which households are being asked to recall the experiences of themselves and of members of their families with the cost and utilization of specific health services or of their health status, it is also difficult to assess the likely quality of the survey data being collected. The research proposal suggests that the relevant data are being collected and hopefully this is the case. The proposal's theoretical model builds on earlier work and, at the level at which it is presented in the proposal, appears appropriate.

The one important issue which does not appear to be addressed in the proposal is the cost of collection of user charges for different types of health facilities. There are many who assert, perhaps on the basis of little evidence, that the cost of collection (inclusive of corruption and mismanagement factors), as a percentage of gross revenue intake, is quite high, particularly for small scale health units. If this is the case, there may be a tendency to overstate the likely revenue implications of increased charges for health services, with possible adverse implications for health services demand. Would it be possible to delve into this question in the provider survey, at least for those institutions already levying charges for services?

I have some additional specific points which are listed below:

Page 8, second para.: Another quality indicator, at least in terms of perceived quality, might be the identification of who delivers the health service, a doctor or a paramedic.

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MAR 22 1984

Yale University

DEPARTMENT OF ECONOMICS
Economic Growth Center

27 Hillhouse Avenue
P.O. Box 1987, Yale Station
New Haven, Connecticut 06520

T. PAUL SCHULTZ, *Director*

Attn: Ms. Phi Anh Plesch

19 March 1984

Mr. Marcelo Selowsky
Operations Policy
The World Bank, Room E-1023
1818 H Street, N.W.
Washington, D.C. 20433

Dear Marcelo:

Enclosed is my review of the Peruvian Health proposal. It is first rate and needs attention on pp. 27-29 to make the case to study first the reduced form equations and then only if a strong case can be made for identifying the structure can the equations on p. 25 be estimated satisfactorily with the available data. Try also to get a stronger analytical team to oversee the empirical analysis. Mr. Dor may be very competent, but I do not know any of his work. Robert Shakotko at Hunter College, New York City University, is a more senior health economist and econometrician who might be urged to steer the project through the modest econometric problems that lie ahead of it. If the structural equations proposed on p. 25 are to be estimated, some rationale is needed for how they might be identified. Simply lagging the variables will not be satisfacotry, even if the data were available from a panel type survey--which they are not.

I am strongly supportive of the project overall, and do not think that my criticisms should delay the project's approval. The changes in empirical analysis will not arise before mid 1985.

Best regards,

Paul

T. Paul Schultz

Enclosure
TPS:lhv

T. Paul Schultz
19 March 1984

"Health Care Demand and Resource Mobilization: The Case of Peru"

The proposal on "Health Care Demand and Resource Mobilization: The Case of Peru" addresses an important policy issue for the Bank, and LDCs, defines its objectives with admirable clarity, and reasons the case well for the add-on collection of health provider data to increase the utility of the large U.S. A.I.D. funded health survey in Peru. The only problem I would note is in the brief section on empirical estimation methododology (pp. 25-28), where some critical questions are not raised and hence left unanswered. Misleading policy conclusions could be drawn if these methods were not amended in the analysis phase.

(1) If the three equations are to be estimated at the top of page 25 of the proposal determining whether health care is demanded (D), how much is demanded (HC), and health status (H), the endogenous variables (on the right side of these equations) determining these outcomes must somehow be identified. The choice of identification restrictions will determine whether the proposed empirical exercise is meaningful. For example, some exogenous variable in the H equation must be excluded from the D equation, if one is to be able to estimate consistently the effect of Health Status (H) on the demand for health care (D). This is implicitly the problem discussed on p. 23, but no satisfactory strategy has been proposed in the health care literature on how to include health status (H) as a determinant of health demands (D), since the errors or unexplained disturbances in H will be serially correlated due to the stock-like character of health "capital." The data being collected here are particularly unsuitable for disentangling this causal effect, since the data will be only retrospective, and not prospective in nature (top p. 29).

If the conditioning socioeconomic variables from the household, X_1, the local environment, X_2, and prices and costs of medical inputs, X_3, describe the systematic determinants of health status, a reduced form equation for health status (H) should be readily estimated by ordinary least squares or single stage qualitative choice models, (e.g. logit, probit, etc.). Such an equation provides the essential information for a policymaker to infer how much difference the provision and pricing of medical services makes for health status of a representative person (efficiency) or members of various socioeconomic groups (distributional consequences).

Similarly, the discrete and continuous measures of the demand for health services (D and HC) can also be estimated consistently as a function of X_1, X_2, and X_3. These reduced-form equations are also defensible. However, these reduced form estimates depend on the assumption that the provision of medical inputs (locality prices and programs in X_3) are uncorrelated with the exogenous health endowments or initial health status of the population. If instead, the medical inputs (e.g. public health clinics) are placed in those regions that have, say, the worst health environment for reasons that are not measured by X_1, X_2, or X_3, then the "true" health status benefits of the clinic inputs might be underestimated. This possible source of bias in estimating reduced form equations cannot be dismissed, but the bias due to this source is likely to be less serious than that generated by introducing the endogenous health status (H) directly into the input demand equations (D and HC), in my judgment. Moreover, the inclusion of HC as an explanation of health status (H) is even more difficult to interpret even if some basis for identification is proposed. This health status function is analogous to estimating a reduced form equation incorporating both production technology and health care demand behavior conditioned on local prices, endowments and technological constraints included in X_1, X_2, X_3, plus health care demands for some of the inputs (HC). It is hard for me to know what a price effect of health care service $\partial H/\partial X_3$ on health status (H) would mean, when it is estimated from the third equation on p. 25 that is also conditioned on the actual (or predicted) use of that form of health care (HC).

All of this discussion is to suggest that reduced form equations in the X's determining D, HC and even H can be estimated from the Peruvian Survey and the additional health provider survey. This will provide policymakers with better estimates of health care demand and status effects of health policy alternatives than we currently have for other populations. This will be a substantial advance for the field. If the research staff attached to this project are innovative they may see some way to model the dynamics of health status changes over time in response to changing provision of health care and changing prices of that care. But the Peruvian data base, rich as it promises to be, is not particularly suitable to this task since it is not a panel survey. Care in collecting the health provider information and local price data retrospectively could open the door to this line of analysis, but I am not sure that the basic survey collected retrospective detail on health status in previous years. Nonetheless, with a strong microeconometric student of health economics, the proposed data should provide us with important estimates to test the hypotheses regarding how time prices, market prices, user fees, and provider quality influence health care utilization and the pattern of mortality and morbidity in a diverse country such as Peru. This outcome of the project fully justifies the associated budget. But obtain the best possible analysts to participate in the project, not a promising pre-Ph.d.

THE WORLD BANK / INTERNATIONAL FINANCE CORPORATION

OFFICE MEMORANDUM

DATE February 13, 1984

TO Messrs. D. de Ferranti, J. van der Gaag

FROM Phi Anh Plesch, VPERS PAP

EXTENSION 69013

SUBJECT Research Proposal: "Health Care Demand and Resource Mobilization: The Case of Peru"

Following the reorganization of the research approval procedures (see attached memo from Mrs. Krueger dated February 8, 1984), the responsibility to vet the substance and quality of the proposals, to consult with the regions and to ensure the operational relevance and usefulness of the proposed research rests with departments and line managers. Therefore proposals submitted to this office for consideration by the Research Projects Approval Committee (REPAC) should be in final form, ready for review by external referees and the Committee.

In light of the above, proposals that have already been submitted under the old procedures are being returned to their sponsoring departments. If resubmitted before c.o.b. Friday, February 17, they will be considered by REPAC at its meeting on Tuesday, March 6. Proposals received after February 17 will be considered at the next meeting of REPAC. REPAC is tentatively scheduled to meet every first Tuesday of the month.

Attachment:

cc: Messrs. J. North, J. Warford (PHN)
G. Ingram, T. King (DRD)
M. Selowsky (OPS)

THE WORLD BANK/INTERNATIONAL FINANCE CORPORATION

OFFICE MEMORANDUM

JAN 13 1984

DATE January 13, 1984

TO Phi Anh Plesch, VPERS

FROM David de Ferranti, PHND; Jacques van der Gaag, DRDEI

EXTENSION 61584 61235

SUBJECT Research Proposal

1. We have the pleasure of submitting to you thirty copies of a Research Proposal titled

"Health Care Demand and Resource Mobilization."
"The Case of Peru."

for consideration at the March meeting of the Research Committee.

2. Since both principal investigators are likely to be on mission some time in February, please with us for appropriate dates when (and if) you set up a workshop and/or panel discussion.

Attachments

J.vanderGaag:ws

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Health Care Demand and Resource Mobilization:

The Case of Peru

A Research Proposal

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Health Care Demand and Resource Mobilization: The Case of Peru

Summary

Cost recovery, the role of user charges, and resource allocation in the social sectors have become salient issues for developing countries in the 1980s, as finance ministries confront harsh macro-level realities while service ministries struggle to meet ambitious public goals within increasingly limited budgets. Using Peru as a case study, this research will develop improved information and methods to assist policy makers and Bank operational staff in addressing these issues in the context of the health sector.

The study originated from a series of discussions on cost recovery involving Bank representatives along with other donor and technical agencies, including the World Health Organization, the Pan American Health Organization, USAID, European aid institutions, the Center for Disease Control and the U.N. National Household Survey Capability Program. A central conclusion emerging from these discussions was that lack of appropriate empirical evidence on demand responses to supply price and quality changes is currently a serious obstacle preventing policy makers from making informed choices among alternative cost recovery options in the health sector.

Shortly thereafter, a joint initiative to collect the household survey data needed to support analysis filling this gap was launched, with Peru selected as the venue and with $1.15 million in funding from USAID (70 percent), the German development assistance agency (17 percent) and the Peruvian health ministry (13 percent) aided by a Bank health project loan.

This survey, designed by a team including the present researchers, is being implemented now. with completion expected before July 1984 Nearly 18 000 households will be interviewed, sampled from all parts of the country ranging from metropolitan Lima to the rural mountainous and jungle areas.

What is requested here is funding for the analysis of these data, along with complementary evidence to be collected on health providers The proposed study includes two major components. The first component will describe the health status of the Peruvian population the essential features of the health care delivery system and health care utilization patterns by type of service, age. sex. ethnicity. income. occupation, insurance status and region. Results from this component will serve as an aid to the Peruvian government and the Bank in assessing future policy and investment options.

In the second component. household and individual demand relationships will be estimated, drawing on recent developments in the health economics literature. The results will be used to answer questions about the likely effect of policies influencing the price of health services Both the revenue implications and distributional (equity) consequences of alternative policy options will be assessed.

The proposal includes a request for partial funding of a provider survey (again co-sponsoredd by various donor agencies) that addresses the relevant cost and productivity issues from the supply side.

The study will start May 1, 1984, and is scheduled to be finished in September 1986. Total funds requested: $229,500.

I. Objectives and Strategy

A. Statement of General Problem and Origins of the Study

A.1. General Problem

Cost recovery, the role of user charges and resource allocation questions in the social sectors have recently become intensely debated issues in many developing countries, as prior patterns of rapidly growing government funds for public programs in these sectors have given way to stagnant or declining trends in the eighties. Developments in the health sector epitomize the emerging concerns about how services should be financed and how limited resources should be distributed. On the one hand, finance ministries, looking for ways to trim outlays as they struggle to exercise fiscal restraint in a period of generally weak economies and burgeoning debt, view with alarm the prospect of uncontrolled future expansion of spending on health--now reaching or exceeding 10 percent of GDP in some industrialized countries. On the other hand, health ministries, committed to ambitious public promises calling for substantial new investments (for example, to meet WHO's "Health for All by 2000" goals), complain of being grossly under-funded and unable to alleviate serious inadequacies and imbalances in the provision of even the most rudimentary services.

While more and more countries have become interested in exploring possible new policies to address these problems, it has emerged with growing clarity that the key policy questions at stake cannot be resolved satisfactorily from presently available evidence. Several of these questions arise often in country/Bank dialogue during project and sector work, including: (i) what would be the effects of increased cost recovery (who would benefit, who would lose, how much in net additional resources would be mobilized, how would the health of the population be affected); (ii) which services are appropriate for which cost recovery alternatives (should some services be exempt from user charges, should others have charges below long run marginal cost, what should be the role of risk-sharing devices--such as social insurance and community-based cooperative schemes); and (iii) how would the population react to new policies aimed at greater cost recovery (how willing and able would various groups be to pay higher charges, what would be the effect on household's consumption of other goods and services--e.g., will nutrition suffer)?

Although the broad principles for examining such questions in what might be called the general case are well known from theoretical work for other sectors,[1/] critical information needed to apply the conceptual framework to the specific circumstances of health care delivery in developing countries is very limited. The elasticity of demand for health services with respect to price (whether in the form of a fee for service, a co-payment requirement for insurees, a drug price, or some indirect cost to users imposed by health providers) is obviously crucial. Yet only a handful of studies have attempted to estimate price elasticities to date for developing countries, and the results--as some of the authors themselves stress--fall far short of providing an adequate basis for policy purposes.[2/] On other factors affecting demand

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1/ See for example, Archarya (1972), Anderson and Turvey (1974), Baumol and Bradford (1970), Feldstein (1972), Munasinghe and Warford (1982), and Saunders and Warford (1976).

2/ Akin and others (1982) on the Philippines; Heller (1976) on Malaysia; Birdsall and Chuhan (1982) on Mali; Ascobat Gani (1981) on Indonesia. See also further discussion of previous research in Section I.C.

(e.g., accessibility, time costs to users, income level, disease patterns, environmental conditions, education, quality of services, and demographic characteristics), slightly more evidence is available.[3/] However, this evidence still is too fragmented and incomplete to help noticeably in assessing what the probable impacts would be of changes in variables subject to policy control. For example, while accessibility (e.g., travel time) is known to be strongly negatively correlated with utilization, it is typically impossible to predict with any reliability the extent to which extending the network of health facilities will affect total service delivery and provider choice.[4/]

In addition, current data have not been sufficient to enable researchers to delve very far beyond simple (and sometimes spurious) correlations--in the direction of trying to understand the underlying causal linkages involved. For example, several analyses have found a positive relationship between utilization of services and fees charged.[5/] While it is generally acknowledged that quality differences across providers (or more precisely, perceived quality differences) have an important role in this

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3/ In addition to the sources listed in footnotes 2, 4, 5 and 6 some information exists from (i) experimental research such as, but not limited to, the Narangwal project (see Gwatkin and others (1980) for a review of recent projects) and (ii) the general literature (e.g., Chernichovsky and Meesook, 1981; Cochrane, 1980; Golladay, 1980; Meerman, 1979; Selowsky, 1979; Wells and Klees, 1980; and World Bank sector reports).

4/ On accessibility there is Ferdell (1965) on Kenya, Frederiksen (1964) on parts of India, Gershenberg and Haskell (1972) and Gesler (1979) on Uganda, Gish (1975) and Van Etten (1972) on Tanzania, Griffen and others (1981), and Popkin and Rocco (1979) on the Philippines, O'Connor (1980) on Afghanistan, and Wooley (1974) on Thailand.

5/ Ascobat Gani (1981) and unpublished Bank and WHO country studies on Bangladesh, Cameroon, Ivory Coast, Lesotho, Rwanda, and Zaire.

result--masking the expected negative correlation--the nature and magnitude of the influence of quality factors remain very much in doubt. [6/]

If, as some observers have hypothesized, quality and other non-price factors (e.g., perceived need for care, reflecting morbidity rates and household preferences between health and other "goods") are so dominant that existing fees for public health services could be raised substantially without affecting utilization appreciably, it would be important to know that. It would also be important to know under which conditions and for which groups in the population this range of relative price inelasticity would and would not apply. Also, if policies that alter quality (e.g., availability of drugs) do affect utilization noticeably, government planners need to know how large the resulting cost and revenue implications are.

Opportunities to conduct productive empirical investigations of many of these issues do not arise often. Attempts to analyze health demand and supply relationships without using household survey data have not been very fruitful.[7/] And no household survey to date has captured all of the relevant information required, including not only household characteristics, prices, and utilization, but also morbidity and mortality patterns, a comprehensive profile of the types and supply characteristics of all providers, and both actual (i.e., directly observed) and perceived quality indicators.[8/]

6/ Akin and others (1982), Young (1981), Spring (1980), and Heller (1976).

7/ World Health Organization (1977).

8/ See also Section II below on data sources.

A.2. Origins of the Study

In the spring of 1983, staff of Population, Health and Nutrition Department initiated a round of discussions with other groups sharing an interest in assisting countries in the area of cost recovery in the health care sector. Representatives of both donor and technical agencies, including the World Health Organization (WHO), Pan American Health Organization (PAHO), USAID, European aid institutions, and the Center for Disease Control (CDC), were consulted, along with university researchers and other Bank staff. The main conclusion emerging from these discussions was that further research along the lines proposed here was needed, based on collection of new survey data, expressly designed for this purpose and building upon the experience gained and lessons learned from previous efforts. Participants agreed that because the full potential of an integrated scheme of household and provider surveys had not yet been realized, a well conceived design with large enough sample sizes and strong host-country support might be able to achieve substantial advances in present knowledge. A review of possible locales for such a study identified Peru as the most promising site, for reasons elaborated in Section I.H. below.

Soon thereafter, a subset of those involved in the original discussions, including the principal investigators of this propsoal and individuals from PAHO, AID, and CDC (with the addition of a representative from the U.N. National Household Survey Capability Program),[9/] began preparation of survey instruments and sampling protocols in collaboration with

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9/ Also, through the assistance of Living Standards Measurement Staff, opportunities were identified for co-ordination with another recently approved research project (RPO 673-26).

Peruvian government agencies, which had strongly endorsed the effort. (Details on the Peruvian involvement are discussed in following sections.) The household survey component was designed and pilot-tested during the remainder of 1983. With co-funding from AID (70 percent), the German development assistance organization (17 percent) and the health ministry of Peru (13 percent) aided by a Bank health project loan, this survey will go into the field February, 1984, and is scheduled for completion by July. The information collected includes extensive socioeconomic information on the households, plus data on health and health care utilization (see Section II.D. for details).

A second component--a survey of health care providers in the locales where households are being sampled--is planned for implementation in May or June. Partial funding for this component is expected to be available from PAHO and the health ministry. The remainder is requested as part of the current proposal. All known health providers in the designated areas will be surveyed, including a sample of traditional practitioners. The information to be collected will cover: the types of services offered, fees charged, utilization figures, supply factors (e.g., size and composition of staff, number of beds), accessibility factors (location relative to user populations, hours of operation, restrictions on who can be served--for instance, social security participants only), quality indicators (status of drug stocks, condition of equipment and facilities, degree of overcrowding, average length of consultation), and whatever cost data (usually very limited) is available.

Evidence on the provider pool, and the ability to link that evidence with the household survey results, are essential not only to analyze the determinants of demand constructively but also to begin to understand the structure of the supply side. Ultimately, the questions that most countries need to concern themselves with on cost recovery and resource allocation require improved understanding of both demand and supply issues. On supply, investigations of costs and production functions, by type of service, will be necessary, since the right sort of evidence is not available from providers' records and previous studies.

Because those investigations are likely to be difficult and time-consuming due to data constraints and the virtual absence of an established empirical literature (for developing countries), we anticipate that they should be carried out in two phases. Here funding is being requested only for the first phase.

In this first phase, demand equations for health and medical care will be estimated, and used to study the demand response to "price" changes in a broad sense. For each type of service we will measure the effect of fees charged, availability (travel distance, travel cost, size of the facility), type of insurance coverage (if any), and perceived quality. Extensive information on health care utilization, health status and household characteristics will be available from the household survey. This information will be supplemented by supply data from the provider survey and other sources (e.g., health ministry records).

The second phase would then aim to explore more comprehensively the underlying cost and production relationships, based on more detailed cost studies of a few selected facilities from each provider category. That phase would be put forward as a separate proposal, once preliminary results have become available from the first phase.

Overall, the present study will have several important advantages relative to previous work in the field:

- linked data from both households and providers, for the same geographical area;
- more extensive information from the provider side than has been available before;
- complete household information, including better data on utilization; health, perceived need, availability and quality of services; income and assets; and environmental conditions;
- much larger sample sizes (18,000 househlds in total); large samples are especially valuable in health studies because many events of interest are comparatively rare (e.g., deaths, low birth weight, certain diseases, hospitalization); and
- willingness-to-pay data and an opportunity to test such data against actual behavior (this point is elaborated in Section II).

Also important is the high leverage that the funds requested here will have Bank participation in the early stages of this effort helped to mobilize $1,000,000 of financing from other donors and $150,000 from the health ministry aided by a Bank health project loan. Without additional funding to assure that the provider survey can be completed and that the results from both surveys can be properly analyzed, these investments will have little impact. If, on the other hand, this proposal is approved, it will bring to fruition a total effort representing five times the value (in terms of the cost required) of the amount currently requested.

B. Objectives of the Proposed Study

The primary objective of the study is to conduct a detailed analysis of household and individual demand for health care, contributing toward answering the salient issues raised in Section A. Particular emphasis will be placed on seeking generalizable quantitative results addressing the following questions:

- o What would be the effect on health care utilization patterns of policies influencing the price of health services? (the introduction or increase of user fees, increased availability, reduction in travel costs, quality changes).
- o What are the distributional consequences of such policies? (which socioeconomic groups of the population will be affected most; how does this relate to the distribution of illness).
- o How much net additional resources would be mobilized?

A second principal objective is to obtain improved understanding of the essential features of health care delivery in Peru, as an aid both to (i) the Peruvian government and the Bank in assessing future policy and investment options (see Section II.D.), and (ii) other countries facing similar choices.

To accomodate these objectives, a study plan has been devised consisting of two main components. First, a detailed descriptive analysis of the survey results will be done, profiling the prevailing patterns of health care utilization by type of service, and by age, sex, ethnicity, income, occupation, insurance status and region. This picture of health care utilization patterns will be "matched" with a similar one on health status. The combined findings will serve the dual role of satisfying the second objective above (providing baseline information specifically sought by

Peruvian officials and Bank project officers as a guide to future project design) and preparing the necessary foundation for the multivariate analysis which is the second component of the study.

In the second component, household and individual demand relationships will be estimated and analyzed, following the modelling approach discussed in Section II. The results will be used as a basis for answering the main questions regarding cost recovery and resource mobilization.

C. Relationship of the Study to Other Current and Planned Research

C.1. Relation to Bank Research Priorities

Research along the lines proposed here has been identified previously as a priority area in documents reflecting the operational goals and work plans of the Population, Health and Nutrition Department (PHND). Two PHND issues papers ("Health Sector Financing: An Overview of the Issues" and "Some Current Methodological Issues in Health Sector Assessment and Project Analysis") have highlighted the need for demand research oriented expressly toward the issues of cost recovery and resource allocation. This recommendation has now become a part of the FY1984-86 OPS work plan.

Independently, the Country Policy Department (CPD) has been investigating similar issues cross-sectorally. A recent draft summarizing this work (E. Jiminez, "Pricing Policy in the Social Sectors: Cost Recovery for Education and Health in Developing Countries," draft) stresses the necessity of obtaining better information on the likely demand response to alternative cost recovery policies. L. Squire of CPD has indicated his support for the sort of research proposed here.

C.2. Relation to Other Research on Health Care Demand in Developing Countries

The very limited amount of existing literature on health demand in developing countries has already been briefly alluded to in Section A, and is described at greater length in de Ferranti (1983, "Health Sector Financing: an Overview of the Issues").10/ The only Bank contribution to date directly on this subject has been work on Mali (RP 672-72).11/,12/ The Mali findings comprise an important advance in the state of empirical knowledge on several key issues. In particular, they lend greater credence to a number of plausible but still controversial hypotheses, including: (i) that ability to pay is not the major barrier it has often been portrayed to be, (ii) that improvements in quality and accessibility are likely to result in significant upward shifts in households' demand curve for health care, (iii) that raising fees might in fact lead to increased utilization insofar as the revenue collected is used to improve quality or accessibility (thereby inducing an upward shift in demand), and (iv) that willingness-to-pay questions potentially can be useful, despite their inherent shortcomings.

At the same time, though, the Mali investigators have been careful to note the limitations of their data, observing that their conclusions are still tentative (e.g., Birdsall and Chuhan, p. 33). In particular, they were not able to estimate a fee elasticity of demand per se, and were hampered by difficulties linking health status information and household socioeconomic

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10/ See also Section II on developed country literature.

11/ C.f., among others, Birdsall and Chuhan (1983), Ainsworth (1983), and Birdsall (1982).

12/ Research by Dov Chernichovsky and Oey Meesook on Indonesia (RPN 672-19) is examining several related issues.

data. Moreover, the Mali sample--small, rural and predominantly at very low income levels--is characteristic of only one of many types of situations about which policy-relevant information is needed.

The present proposal builds upon and in some respects is a natural extension of the Mali work. That work has made a significant contribution in providing empirical reason to expect that certain important but difficult questions may, after all, be researchable, and has called for further efforts to resolve them (e.g, Birdsall and Chuhan, p. 35). The present initiative will be better able, given its more extensive data base, to carry out at least a portion of that mandate.

Among other past studies, the work by Akin et al. (1982) on the Philippines has demonstrated the virtues of distinguishing carefully among different subpopulations (e.g., infants, women in pregnancy, others) and the need to assure consistency between the household survey results and provider information. Heller's Malaysia analysis has underscored the initial role of choice among alternative providers.

While the present proposal was under development, contacts were made with other groups with similar interests, in case they may have ongoing or anticipated studies that might be generating relevant new findings in the near future. Discussions with USAID officials identified nearly completed efforts in Honduras and Panama, but unfortunately neither appears to have data bases adequate for our purposes; planned efforts in a few other countries are still in very tentative development stages. In the United Kingdom, an ongoing study by the Ross Institute on Jamaica is collected some interesting utilization data, but not enough price or household characteristics information for an adequate demand analysis.

D. Expected Usefulness for Bank Operations and Planning Authorities in Peru

The findings of this study are expected to be directly useful both to Bank staff and to borrower country planners in several ways. Not only are the issues to be examined (as outlined in Section A) of clearcut policy relevance from the perspectives of both health sector development and finance ministry concerns about the fiscal implications of health programs; but the study will also contribute to: (i) Peruvian and Bank evaluation of the recently approved health project loan, for purposes of mid-course corrections (if needed) in the project design or implementation and preparation of a second project; (ii) government/Bank dialogue on other aspects of the health sector, not included in the project; and (iii) the development of PHND knowledge on appropriate future strategies for health project lending in other countries.

With respect specifically to (i) and (ii), close coordination between this study and the current project, in both substance and timing, will be facilitated by the fact that one of the study's principal investigators (de Ferranti) has also been the project team's economist and financial analyst. He will also be part of the team that will help the Peruvians to design and implement the evaluation component of the project (mentioned on pg. 23 of the Staff Appraisal Report). With respect to (iii), discussions within PHND have already begun on how evidence from the Peru household survey in conjunction with project data can be utilized in assessing the extent to which the primary health care approach being tried in Peru is appropriate for other countries as well.

The project's main attributes include several features of particular interest for the study's purposes. The bulk of the approximately $54 million (1982 prices) investment will be targetted to four distinct parts of the country:

- o La Libertad - a costal area in the north that includes the peri-urban zone of Trujillo.
- o Centro Medio - an area in the Andes with a population dispersed in small towns and inaccessible villages.
- o Ucayali - in the eastern part of the country, where about half of the population lives in urban areas, while the rest inhabit the areas along the rivers in the jungle.
- o Lima - selected areas inhabited by the urban poor.

These project sites were among the 15 main sampled areas in the household survey and will be separately identifiable in the survey data tapes. The sites are characterized by scarce and low quality health services. They were selected with the intention to provide a basis for future extension of the project strategies to the rest of the country.

The project finances the construction, furnishing and equipping of 60 new health centers and about 118 health posts. An additional 66 existing health centers and 60 health posts will be upgraded, with some facilities receiving added staff housing, hospital beds and surgical rooms. In all, 65 of the health centers and 69 of the health posts are located in urban areas, while the remaining 61 centers and 109 posts are in rural areas. A delivery system concept will be used that is organized around clusters of families (with a single "module" averaging 6,400 families in urban areas and 2,400 families in rural areas). Other components of the project will improve and expand health worker training programs.

E. Contribution to Developing Indigenous Research Capacity

In combination with other related and ongoing efforts, the study will help provide opportunities for enhancing the capabilities of: (i) the principal data collection institution in Peru, the Instituto Nacional de Estadisticas (INE)--the government's statistical and census agency; and (ii) university researchers at one or both of the two main foci for social science research in Peru, the Universities of Catolica and Pacifica.

INE is carrying out the collection and data tape preparation for the household survey.[13/] The added experience INE will gain in this survey with respect to scale (i.e., managing large surveys), subject matter (administering health status and willingness-to-pay questions), and geographical coverage (reaching some rural areas where it has not worked before) will better equip it to handle future tasks. One such task, already slated to follow soon after the present one and based on the same sampling frame, will be a survey for the Bank-funded research project on labor market issues in Peru (RPO 673-26). Although none of the funds being requested here will directly support INE, the interchanges and cooperation anticipated between INE and this study's researchers will continue and strengthen ties initiated during the survey preparation phase. They will also provide possibilities for sharing technical approaches and methodologies to data management and analysis. Where the earlier phase largely involved planning, the present work will be the first opportunity for INE to explore the fruits of their labors in conjunction with researchers with different perspectives.

13/ See also Sections I.H. and II.D. on INE's role.

Researchers at Catolica and Pacifica universities have been apprised of the surveys and the proposed analysis; they will be consulted periodically during the early stages of the analytical work and as the findings become available. In addition, a team drawn from one or both insitutions will be centrally involved in the provider survey. Through these contacts, Peruvian researchers will be encouraged to use the data collected to undertake additional investigations, expanding their interest and expertise in health-related research.

G. How the Intended Audiences Will be Served by the Output of the Study 14/

The intended audiences for the output of the study are Bank staff, Peruvian officials, and, secondarily, others engaged in addressing health sector issues in developing countries confronting similar choices. Since the potential usefulness of the study findings to these audiences has already been discussed (Sections A and D), we turn now directly to the form and timeliness of the output.

All results will be written up in working papers to be made available, after appropriate clearances, to all Bank staff in the relevant regional and sector departments, as well as to Peruvian officials (in the health ministry and INE), Peruvian researchers, and other participating agencies. When suitable, these papers will also be submitted to the professional journals in the fields of health economics and public policy, for peer review and publication.

14/ Section F ("Expected Contribution to Knowledge of Development Processes, if not Described Elsewhere") is covered in the discussion under Sections I.A and I.B., and has therefore been omitted.

It is anticipated that all results will be available in time for health sector work in Peru in preparation for a second project, or for final evaluation of the first project. As preliminary findings become ready, they will be shared informally with interested staff in operational work as expeditiously as possible. Although the study has two phases (first descriptive and then analytical, as noted in Section B), intermediate results from both phases will probably become available simultaneously. This will be more likely the more that INE is able to devote additional time to the descriptive part.

H. Reasons for the Choice of Countries to be Involved

Peru has several distinct advantages as a site for the study.

First, a Latin American country is desirable because all previous work in this field has been on Asia (Indonesia, Malaysia, and the Philippines) and, to a lesser extent, Africa (Mali). Evidence from Latin America is needed not only because it is a large part of the world about which very little is known currently, but also to provide a firmer basis for generalizing about underlying relationships relevant for all regions. At present, it is difficult, given the limitations of previous efforts, to discern how much of their findings are generalizable and how much merely reflect local circumstances. While the addition of new and better evidence for a country in the one continent presently not included will not eliminate this problem entirely, the added breadth from having all major regions of the developing world represented undoubtedly will help in interpreting the available evidence more broadly.

Second, a country with a wide range of different sets of conditions with respect to health status and the supply and demand of health care facilities and services is obviously advantageous. The large variety will enable us to assess the stability of the key parameters across diverse situations, once again increasing the generalizability of the findings. Previous efforts have concentrated on relatively small geographical areas, mostly uniformly rural, low-income sites. Peru offers the full gamut of socioeconomic and health care contexts ranging from urban, multifaceted Lima to the extremely impoverished and underdeveloped mountainous and jungle areas. There are traditional tribal groups and modern barrio dwellers. Because the survey sample will be large enough and widespread enough to reach all parts of the country, 15 separate districts can be analyzed independently and in combination. Few other countries in Latin America provide as much diversity.

Third, Peru provides a typical example of a developing country that needs to search for alternative financing sources to meet current and future health needs of the population. As in most developing countries, the vast majority of public expenditures on health is financed from general revenue, with other sources (e.g., fees) accounting for less than 20 percent. However, health's share of total government outlays has been under increasing pressure in recent years. Foreign aid can ease the burden only temporarily. New policies are clearly needed to assure more dependable sources of steady funding in the future.

Fourth, Peru has indigenous institutions with a proven track record in collecting the sort of data needed for this study. INE has successfully completed previous surveys on demographic characteristics (see forthcoming report by K. Hill, National Academy of Sciences), and on income and expenditure both for consumer price analysis and for household budget studies (see book by P. Musgrove, a collaborator on this survey's design, on results from the ENCIEL study). INE's strengths and weaknesses are known. Its top officials and technicians have worked closely in the past with the representative of the U.N. National Household Survey Capability Program who has assisted in the development of the current survey (A. MacDonald).

Fifth, adequate assurances have been obtained that the data collected will be made available in full to the researchers of this study and other users on a timely basis. A synopsis of the agreement (in Spanish) signed by INE and participating donors is included in the annexes.

II. Design

A. The Analytical Framework 15/

Our immediate objective is to study the demand for health in Peru. The research proposed here will be based on a household survey and is unique in that both urban and rural areas will be considered. The findings of the descriptive study on health care utilization will indicate to policy makers what services need to be expanded in which regions in order to meet the health needs of the population.

The analytical part of the study will draw heavily upon recent developments in the health economics literature.

Conventionally, demand equations are derived from the maximization of utility function subject to a single budget constraint. The resulting demand equation specifies demand as a function of prices and income.

15/ This section includes a discussion of the methodology; Section III.A. will include the specific research tasks. Consequently Section II.B. and II.C. have been omitted.

This model has been undergoing various specifications to address more realistically the issues relevant to the demand for medical care. One relatively simple, but quite important, modification is due to Acton (1973) who includes the time cost of obtaining medical care. Of the many results of Acton's work, one is particularly relevant to the proposed research: As the money price of a medical service approaches zero, the demand becomes more sensitive to the time cost. Thus, when medical care is offered free of charge the extent of utilization of services will become very sensitive to changes in such factors as the travel distance, waiting time and per capita availability of medical services. Precise measurement of these effects is particularly relevant when new facilities are being introduced and, at the same time, user fees are being levied.

Grossman (1972, 1975) has extended the simple utility-type model by introducing both an (health) investment and a consumption motive in the demand for medical care. As in Acton's model, the full-price of medical care should include the time-cost associated with obtaining care. The theoretical implications of the models by Acton and Grossman are now well understood, and most of the current studies on the demand for health care take one of these models as a starting point (or a modification, see for instance Muurinen (1982)). Most, if not all of these studies use data from developed countries.

Only recently has attention been paid to the peculiarities of health economics in developing countries. There are significant structural differences between developing and developed countries. In high income countries human capital (education for example) or the list of environmental factors are <u>relatively</u> uniform and may be taken as invariant. This is not true in most developing countries such as Peru, where half the population is

Indian, living predominantly in the high Andes or Amazon jungle areas where adult literacy is low and infant mortality rates are high. Moreover, the distinction between the demand for acute health needs (which have to be met despite unfavorable travel conditions, deficient information and severe resource constraints) and discretionary demand for health care (i.e., demand beyond minimal health requirements) is of much greater importance in developing countries, where minimal needs often go unmet. In Peru, for example, the health ministry has estimated that 25 percent of the population has no effective access to modern health care of any kind.

A third, and very important issue is the choice of the provider. When two types of providers (say, traditional and modern) are available to the household, which factors determine the choice between these providers? To what extent can these choices be influenced by policy measures such as fee schedules and insurance coverage?

And finally, much more attention needs to be paid to incorporating health status in the demand equations. It is now generally accepted that health should be treated as an endogenous variable. Grossman's model provides the theoretical justification for running separate regressions on health capital and on medical care, having essentially the same set of explanatory variables. Heller (1976, 1982) defines a health status function (H), which incorporates economic variables, preventive services and environmental conditions (hygienic quality of the home). Needed health care (m) is an inverse function of health status $m = G(H)$.

Lewit (1983) develops a survival production functions showing that the probability of the survival for the infant depends in part on expenditures on health care. Van de Ven and van der Gaag (1982) estimate a model in which both health and income is determined simultaneously, together with the demand for health care. Health is treated as an unobservable (latent) variable. A multitude of health status measures is used to serve as indicators in this so-called MIMIC (Multipical Causes, Multiple Indicators) model. Wolfe and Van der Gaag (1983) address the questions of how to choose among those indicators. They show that the common practice of using simple exogenous proxy variables to "condition" the demand equations for health status may lead to biased estimates of income effects and the effect of such variables as age, sex, ethnicity and education. They propose various alternative models to deal with this problem. The large number of health variables available in the current study will allow us to estimate these models with greater precision than was previously possible.

We should finally mention the path-breaking work at the RAND Corporation on the demand for medical care. On the theoretical (and econometric) side, the RAND researchers showed convincingly the superiority of multi-equation models over single equation models. Schematically, a "properly specified" demand model starts by analyzing whether or not any medical care has been received. Then, conditional upon non-zero medical consumption, the number of doctor visits, hospital days, the amount spent on drugs, etc. is regressed on the usual socioeconomic variables, prices, environmental factors, etc. Perhaps the single most important result of the RAND studies is the finding that price elasticities of demand are much higher than was previously thought. Unfortunately, since these results pertain to a situation much different than one usually finds in developing countries, these results can not be taken as "ball-park" estimates for the Peruvian case.

Based on the recent theoretical and empirical developments in the health economic literature, and modifying the existing models to make them more suitable for developing countries in general, and Peru in particular, we anticipate to estimate models of the following general form:

$$D = F_1(H, X_1, X_2, X_3)$$

$$HC = F_2(H, X_1, X_2, X_3, \mid D = 1)$$

$$H = F_3(HC, X_1, X_2, X_3)$$

where:

$D = 1$ if any health care, modern or traditional, has been received during the period considered.
$= 0$ if not.

HC is a vector of health care utilization by type of provider.

H is health status (or a vector of health status indicators).

X_1 is a vector of socioeconomic variables.

X_2 is a vector of environmental factors.

X_3 is a vector of all prices and other variables related to the cost of care.

The first equation is of significant importance, since in some regions over 50 percent of the population does not receive any care other than from curanderos and other types of traditional practitioners. Though in some cases the "explanation" for this is relatively simple (no health care facilities are available), other factors, such as high costs (relative to income levels) or lack of information, may play an important role. The analyses will be carried out by type of provider with special focus on the effect of relative prices on the provider choice.

The second equation (or set of equations) measures health care consumption either in physical units (visits to a doctor, days in a hospital, etc.) or in total expenditures (drug costs). This part of the analyses is conditional upon receiving any care. Again the analyses will be carried out by type of provider. The following providers are included in the household questionnaire:

- o hospitals,
- o health centers (usually located in towns and urban clusters, provide maternal and child health services, communicable disease control and outpatient medical care),
- o health posts (located in smaller towns and rural communities, attended by health auxiliaries supervised periodically by a physician),
- o private doctors or nurses,
- o traditional practitioners,
- o vendors of medicines (e.g., pharmacies and street sellers).

A distinction will be drawn between centers and posts with and without beds. The only data currently available on the proportions of each type of provider within the health system is largely outdated.

The vector X_1 contains the standard socioeconomic variables:[17/]

- o age;
- o sex;
- o ethnic group;
- o family size;
- o individual income;
- o household income;
- o occupation and employment;
- o education (literacy and highest grade or diploma earned).

When suitable, the analyses will be carried out for various socioeconomic groups separately (for instance for the demand for maternal and child

18/ See Section II.2. for more details on the data.

health care). Both inter-household and intra-household variations in the demand for health care will be analyzed.

The vector X_2 represents environmental factors such as:

- o indicators of the housing quality;
- o source and quality of drinking water;
- o occupation and employment indicators of the region;
- o morbidity patterns in the community;
- o climate.

Obviously, not all variables in X_2 are relevant in all equations.

The vector X_3 contains the variables of greatest interest for this study:

- o information on the money cost of modern and traditional health services:
  - money fees,
  - the value of in-kind payments,
  - insurance coverage.

- o information on the time cost of services:
  - per capital availability of facilities and services,
  - travel time and cost,
  - waiting time.

Payments in-kind in terms of goods, labor services and land usage are a prevalent practice in Peru, and enter into the full price of medical care. A potential problem is to obtain the value of these in-kind payments, but estimates of this are available from the survey.

Only 18 percent of the population receive insurance coverage from the Peruvian Institute of Social Security (IPSS), which was formed by a merger of all Social Security systems for blue and white collar workers. All salaried workers, their spouses (for pregnancy, delivery and postpartum) and children in the first year of life are supposed to be beneficiaries. Contributions are 15 percent of payroll based on minimum wages. Fifty percent of the budget is devoted to pensions and the other fifty percent goes for health services including medical care, sick leave, maternal benefits and milk allowances.

Insurance coverage, whether public or private, is mainly relevant in the urban areas. The vast majority of the rural population is not insured against medical costs.

The effect of insurance coverage on the demand for health care in Peru is not well understood. In fact, an early study finds that insured workers and employees demand fewer physician visits, per capita, and fewer hospital days than the average Lima resident (Hall, 1969). The most plausible explanation for this unexpected finding is that the population groups compared differ significantly in one important dimension: health. As is often the case, the unconditional ranking of health care users reverses itself once health care status is adequately controlled for. The current study can address this issue, and consequently will shed light on the "true" effect of health care coverage on the demand for medical care in Peru.

As stated in Section I the time price of medical care becomes more important when money prices approach zero. In fact we expect the time price to be a dominant factor in the first equation, especially for those services that are provided free of charge (e.g., by religious institutions). The household survey has been designed to collect as much information on travel distance, travel costs, queuing, and treatment time, as possible. This information will be augmented by region specific per capita availability measures obtained from various resources. These measures will be updated and refined once data from the provider survey become available.

The third equation is included in the schematic model to highlight the fact that health is endogenous, and among other things, depends on the use of medical care. Based on previous experience, and on various publications in the health economic literature, we expect the effect of health care on health to be particularly large for children. Of course, the household survey contains only retrospective data on both health and health care, which makes it less suitable for a study of the effect of health care on health. But if the effect is strong enough, it should show upon the data. This will allow us to go one step beyond our original goal; i.e., we will obtain estimates of the effect of changes in the (full) price of medical care on both health care utilization and health.

The findings from the extensive analysis of the demand for medical care will provide the information necessary to address the cost recovery issues. Thus, a household's "willingness-to-pay" for medical care will be inferred from observed utilization patterns, as is customary in the economic literature.

One major problem with this approach occurs in the case where the sheer lack of facilities renders, by definition, no observations other than zero utilization. The large size of the sample, and the opportunity to make across-regional comparisons while controlling for regional specific characteristics, should reduce this problem in this study. We nevertheless will pursue one alternative option to measure willingness-to-pay: the use of subjective evaluation questions in the current absence of utilization.

The literature on the usefulness of subjective measures in economics is rather small, and researchers seem to be solidly divided into two camps: believers and skeptics. A recent review of this literature, however, shows both successful applications and failures (Van der Gaag, 1983). The final verdict on the method still awaits further experimentation and more careful scrutiny. A limited number of subjective questions is included in the household survey. In some instances, reactions to hypothetical situations can be "double-checked" by actual demand behavior, thus providing us with a yardstick to assess the reliability of findings in those cases where we have to rely on (subjective) responses to hypothetical situations. We should repeat that we do not expect, in this study, to find a large number of cases (types of facilities, regions) where we have to rely solely on subjective evaluation methods to assess willingness-to-pay and, consequently, to assess the likely consequences of various cost-recovery options. The problem, however, is a general one. Our results will enhance our ability to evaluate findings by researchers who are not so lucky, and who have to rely on subjective measures only.

D. The Data

As has been noted, the nationwide household survey to be conducted by INE will be completed during the first half of 1984. Besides relevant price and utilization data, the questionnaire includes components on:

Characteristics of the Home

- explores dwelling characteristics and assets owned by the household

Characteristics of Household Members

Maternal History, Infant Nutrition, Infant Mortality

Child Health

Adult Health

- includes morbidity as well as health care utilization data

Community Health

The questionnaire is a product of discussions which took place during 1983 among all parties concerned. It draws on the experience of LSMS, adapted to suit the country and subject matter.

Detailed accounts of episodes of illness for all members of the household, and information on vaccinations or use of medicine, will be obtained. Questions on health care utilization are not restricted to primary health care facilities, such as clinics, health posts and centers, but also deal with hospital care, both private and public. Wherever possible a distinction is made between inpatient and outpatient care. Other items include utilization of physicians in private practice, private or charitable clinics, and the curative services of traditional healers, pharmacies or medicine sellers. As is appropriate in a country with high fertility rates, the most exhaustive treatment is given to maternal and child health care. Health care utilization during or after pregnancies and deliveries, and the outcome in terms of infant survival and child health, are of particular interest.

The socioeconomic data will include not only standard information such as sex, age, relationship to head of household, marital status, etc., but also details regarding employment, income, wealth, literacy, education and health insurance coverage. In many ways, the socioeconomic and health components are intertwined. The questions on dwelling characteristics were designed to indicate the level of economic well-being as well as the sanitary conditions in the home. Sections 3 and 4 trace difficulties that consumers face in obtaining health services stemming from travel to distant providers, lack of information on the part of consumers, cultural biases, etc. Ability and willingness to pay are dealt with not only in terms of money costs, but also in terms of travel and in-kind payments or gratuities.

For the purposes of the survey, the country will be divided into the following 15 statistical domains based on ecological criteria. All domains will be surveyed simultaneously.

- Lima Metropolitana
- Costa Norte - urban
- Costa Norte - rural
- Costa Centro - urban
- Costa Centro - rural
- Costa Sur - urban
- Costa Sur - rural
- Sierra Norte - urban
- Sierra Norte - rural
- Sierra Centro - urban
- Sierra Centro - rural
- Sierra Sur - urban
- Sierra Sur - rural
- Selva Alta
- Selva Baja.

To some extent this division also reflects cultural differences and regional variations in income. Lima constitutes the single most populous domain . At the other extreme are the Selva (jungle) regions which are so thinly populated that it was decided not to split them.

The regional division will allow for a separate analysis of the rural and urban populations. This is of specific importance when we focus on the poorer, underserved and needier segment of society. In general it will improve our ability to perform group-specific analysis, thus enhancing our understanding of the distributional questions underlying the cost recovery issues.

Nationwide, 18,000 households will be interviewed. Within each domain interviews will approach 30 clusters comprised of 30 to 35 households. In terms of the number of individuals covered, over 50,000 observations are expected. The large number of observations increases the likelihood of obtaining data on rare episodes of illness and will enable us to make separate inferences for infant, child, maternal and adult population in each one of the domains.

E. Nature of Final Product

Working papers will be made available to Bank staff, Peruvian government agencies and other sponsors, as early as possible. First draft of all descriptive analysis should be available in September 1985. When suitable reports will be sent to professional journals in health economics and public policy for peer review and publication. We anticipate that enough new information and research output will become available for a book manuscript on cost recovery in the health care sector, to be written after completion of the study.

III. Organization

A. Research Tasks and Work Program

The pilot study for the household survey went into the field on January 2, 1984. A typical cross-section for the entire country was chosen from Lima and adjacent rural areas. The nationwide household survey will be conducted from February 7 to July 7, 1984. First data tapes are scheduled to become available in September/October 1984.

Prior to the analysis of the household survey data, two research activities will take place:

1. Further development of the theoretical model(s) for the demand for health care, emphasizing the specific features of a developing country in general and those of Peru in particular.

2. Development of the provider questionnaire. This activity will parallel our efforts to find co-sponsors for that survey (a research proposal on this matter is currently being prepared within PAHO). It will also require the participation of INE, the Peruvian institution already involved in the household survey.

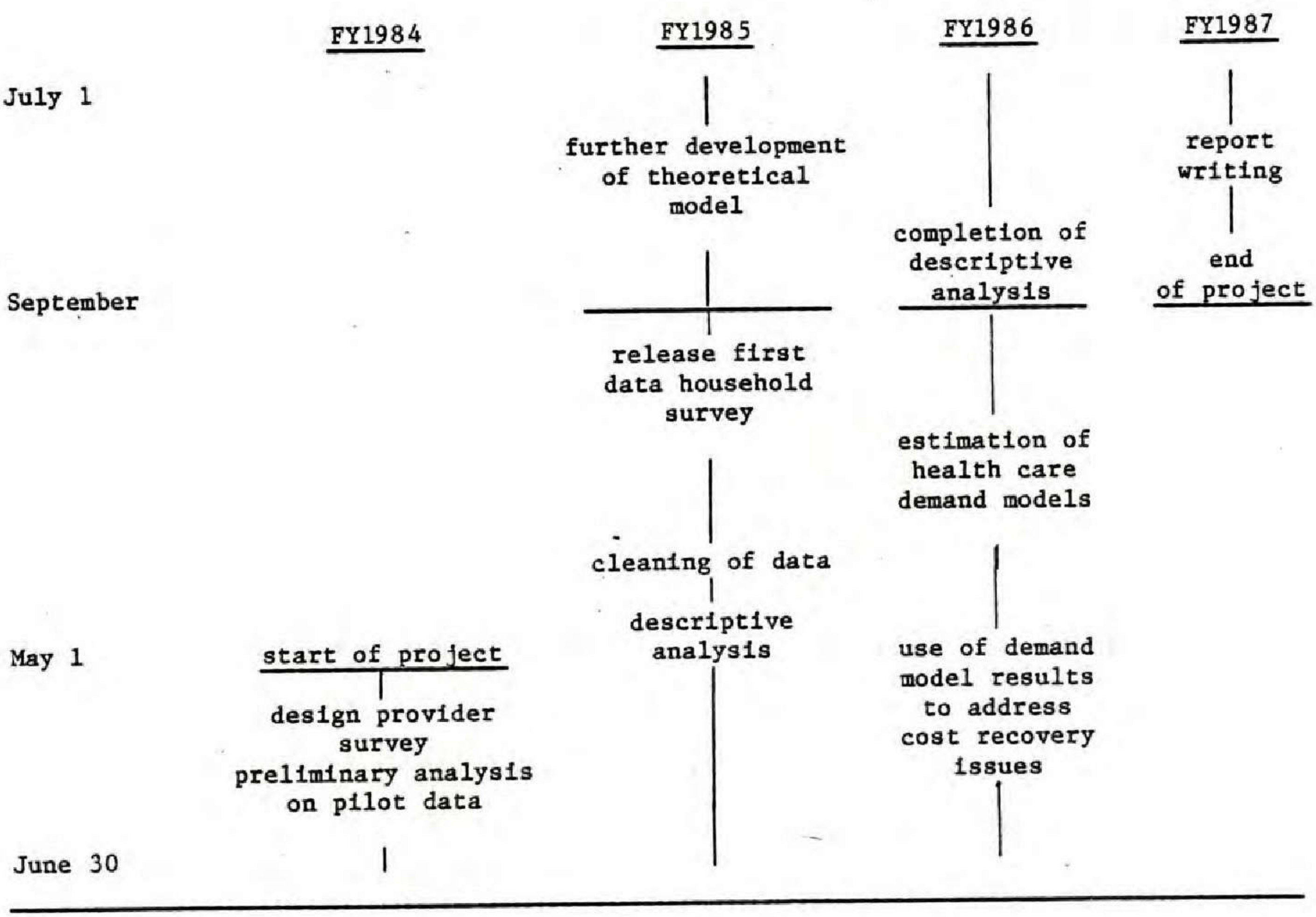
As stated in Section II, the main study consists of two tasks: a descriptive one and an analytical one. Prior to the analytical work, researchers will be able to consult comprehensive cross-tables which will summarize the data. The choice of summary statistics was made jointly by the sponsoring agencies, in close consultation with INE. They are designed to provide immediate information on two scores: (i) The relationship between socioeconomic and demographic characteristics and health status and (ii) the impact of some of these traits, health care availability and full prices on health care utilization. This information is of relevance to policy makers interested in identifying sources of variation in health and economic indicators and areas of greater deprivation. In addition to their descriptive power, the cross-tables will give us some insight as to the socioeconomic classes or specific age groups that ought to be studied separately, as well as the type of services we might focus on in the different regions during the second phase of the research.

The end of the first phase will be an excellent opportunity of intermediate review. We anticipate this research task to be completed within one year after obtaining the data.

The analytical part will take another year. First, demand equations for medical care will be estimated. Secondly, the results will be used to address the cost recovery issues. We anticipate this task also to take one year. Figure 1 sketches the proposed time schedule.

Figure 1

Time Schedule



B. Consultants

The Instituto Nacional de Estadisticas (INE) will conduct the household survey. Contacts are being made with universities in Peru to design and conduct the provider survey (see Section III.D.).

Mr. Avi Dor will serve as a consultant to the project. He obtained his education at the graduate center at CUNY, specializing in the Economics of Human Resources and Applied Econometrics. His previous experience in health economics stems from research work at the National Bureau of Economic Research (NBER). He was highly recommended as suitable for the job by the director of the NBER Health Program, Professor M. Grossman.

Mr. Dor's early involvement in the Peru survey work (as a consultant to PHND) guaranteed that the household questionnaire includes all the information relevant to this study. His vitae is enclosed as Annex V.

C. Coordination among Bank Departments

Coordination between PHND (the principal operating Department involved) and DRD should pose no difficulty since each is represented on the study team. As was pointed out in Section I.D., one of the principal investigators, de Ferranti, has also been serving as the economist on the project team for the recently approved Bank loan. Staff from the Country Programs Department (LC1) have been briefed and have indicated their support for the study. To assure good coordination with LC1 throughout the course of the analysis, the study team will regularly review their progress with the PHND project officer, Margaret Valdivia, who has encouraged the effort strongly and has agreed to keep the LC1 loan officer fully informed and updated.

Members of the study team will travel to Peru several times to resolve questions about the data, discuss preliminary results with Peruvian collaborators and other interested parties, and to help with the dissemination of the findings. All visits will be coordinated with -- and where possible synchronized with -- the project supervision missions.

D. Nature and Extent of Collaboration with Peruvian Research Institutes

As has been noted the Instituto Nacional de Estadtisticas (INE) is collecting the household survey data, preparing clean data tapes, and generating initial cross-tables described in Section III.A. An agreement has been signed by INE and the donors, under which INE agrees to provide complete, cleaned data tapes to each donor (the World Bank, AID, and the German GTZ) as soon as possible after processing the collected questionnaires. (The terms of the agreement are given in a cable included here as an appendix.)

Approaches have been made to researchers at both Catolica and Pacifica universities (including C. Aramburu, C. Figueroa, and D. Cotlar, among others) regarding their interest and capabilities for participating in the conduct and analysis of the provider survey. It is expected that agreements could be signed before April 1, 1984.

E. Extent of Awareness, Support, or Participation by Governmental Agencies

Besides INE, the main governmental agency involved will be the Ministry of Health, where assurances have been received from Juan-Manuel Sotelo, the de facto director of the Bank loan project, of this Ministry's full support and participation in the study. Sotelo's representive has been a part of the Peruvian advisory group assisting INE in the design phase of the household survey. Another member of his staff will play a major role in finalizing the provider survey. Arrangements for the provider survey will be aided by a provision of the project loan which requires that the Ministry of Health carry out a health financing study, identifying the primary sources and uses of public and other funds in the health sector. A consultant team recently has been selected for that study, which will include researchers from the University of Pacifica. While the purposes of the health financing study are slightly different from those of the currently proposed provider survey, the two will undoubtedly assist each other, both in content and in identifying who to see and how best to proceed.

IV. RESOURCE REQUIREMENTS

A. Bank Staff

Total staff time requirements for this project are estimated at 36 weeks, to be divided as follows:

	de Ferranti	van der Gaag
FY1984	1	1
1985	8	4
1986	8	6
1987	4	4

Secretarial assistance will be provided by PHN.

B. Research Budget

The total Research Budget is estimated at $229,500, as summarized in Table 1, by Fiscal Year.

Table 1

Research Budget by Fiscal Year

May 1984 - June 1984 (FY1984)

1.	Consultant	$ 4,200
2.	Travel, 1 trip, Peru	4,000
3.	Miscellaneous	1,000
		$ 9,200

July 1984 - June 1985 (FY1985)

1.	Consultant	$ 25,000
2.	Research assistant/programmer (part-time)	12,500
3.	Travel, 3 trips, Peru	12,000
4.	Computer time	40,000
5.	Provider survey*	50,000
		$139,500

July 1985 - June 1986 (FY1986)

1.	Consultant	$ 25,000
2.	Research assistant/programmer (part-time)	12,500
3.	Travel, 3 trips, Peru	12,000
4.	Computer time	20,000
		$ 69,500

July 1986 - September 1986 (FY1987)

1.	Consultant	$ 6,300
2.	Miscellaneous	5,000
		$ 11,300
	Total	$229,500

Travel costs estimates are based on recent previous missions to Peru.

Air Fare, round trip, Lima	$ 2,400
Average subsistance, two-week stay	1,600
	$ 4,000

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* See text.

The services of an experienced research assistant/computer programmer are expected to be necessary, given the enormous size of the survey, and the corresponding data management problems.

The $50,000 funding for the provider survey will not be utilized unless adequate funding from co-sponsors can be obtained.

As mentioned in the introduction, the principal investigators have been instrumental in the design and organization of the household survey. The survey itself is being paid for by AID (70 percent), a German development assistance organization (18 percent) and the Bank's health sector loan to Peru (12 percent). Total cost of the survey is $1.1 million.

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ANNEX I

Text of Agreement with INE on Data Release

ACTION COPY

Department of State

INCOMING TELEGRAM

ACTION AID-00

ACTION OFFICE LADR-03
INFO LASA-03 LADP-03 GC-01 GCLA-03 GCFL-01 STHE-01 STN-03
SAST-01 HHS-09 RELO-01 STMP-01 MAST-01 /031 A1 X14

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AIDAC

FOR LAC/DR/HN

EO 12356: NA
SUBJ: NATIONAL NUTRITION AND HEALTH SURVEY

REF: A. TELCON KELLEY/OVERHOLT 25 AUGUST 83, B. STATE 224573

1. PER TELCON, USAID HAS CONSULTED INE ABOUT NECESSITY FOR PREPARATION IN WASHINGTON OF DRAFT OF SUBJECT QUESTIONNAIRE COMPONENTS ON DEMAND FOR HEALTH SERVICES (INCLUDING INCOME AND HEALTH EXPENDITURES) PRIOR TO MEETINGS HERE 10-14 OCTOBER. INE REQUESTS DRAFT ONE WEEK PRIOR TO MEETING TO PERMIT INTERNAL REVIEW. PLEASE HAVE DRAFT TRANSLATED IN WORLD BANK.

2. FYI, LIMITED SCOPE GRANT AGREEMENT FOR SUBJECT SURVEY WAS SIGNED 29 AUGUST 1983.

3. CONDITIONS FOR RELEASE OF DATA SUGGESTED REF B WERE SUBMITTED TO INE FOR REVIEW AND APPROVAL. THE FOLLOWING CONDITIONS, WHICH INCLUDE INE'S MODIFICATIONS, WERE INCLUDED IN THE GRANT AGREEMENT AS SPECIAL PROVISIONS:
"LAS SIGUIENTES CONDICIONES RIGEN PARA LA TRANSFERENCIA DE Y EL EMPLEO DE LOS DATOS ESTABLECIDOS POR LAS ORGANIZACIONES INTERNACIONALES INVOLUCRADAS EN LA ENCUESTA (GTZ, BANCO MUNDIAL, OPS, AID Y COSI) Y OTRAS ENTIDADES NACIONALES:

A. LOS DATOS (EN FORMA DE CINTAS MAGNETICAS PARA USO DE COMPUTADORAS) PODRAN SER TRANSFERIDOS POR EL INE A LAS DEMAS AGENCIAS NACIONALES E INTERNACIONALES NOMBRADAS, SIENDO SIEMPRE DE PROPIEDAD DEL INE. EN PARTICULAR, NINGUNA DE ESAS INSTITUCIONES RECEPTORAS DE LOS DATOS TENDRA EL DERECHO DE TRANSFERIR LOS DATOS A TERCEROS, SIN LA EXPRESA AUTORIZACION DEL INE.

B. LOS DATOS PODRAN SER TRANSFERIDOS UNA VEZ CUMPLIDAS LAS SIGUIENTES TRES CONDICIONES FUNDAMENTALES: (I) EL ARCHIVO ESTE LIMPIO, EN EL SENTIDO DE HABERSE REVISADO TODAS LAS VARIABLES PARA CORREGIR INCONSISTENCIAS LOGICAS O ARITMETICAS--SIN QUE ESTA CONDICION IMPLIQUE QUE NO PUEDEN EXISTIR TODAVIA ALGUNAS INCONSISTENCIAS A SER DETECTADAS Y CORREGIDAS POSTERIORMENTE, (II) SE TENGA UN LIBRO DE CODIGOS, QUE DESCRIBA EL NOMBRE DE CADA VARIABLE, LOS CODIGOS USADOS PARA REPRESENTARLA, LA GAMA DE VALORES PERMITIDOS, ASI COMO EL DETALLE DE LOS FACTORES DE EXPANSION DEL DISENO MUESTRAL; (III) QUE SE HAYAN PRODUCIDO, POR EL INE, UN PRIMER CONJUNTO DE TABULADOS, DEFINIDOS POR UN ACUERDO ENTRE LAS AGENCIAS NOMBRADAS.

C. SI UNA AGENCIA RECEPTORA DE LOS DATOS, DETECTA UNA INCONSISTENCIA EN LOS MISMOS UNA VEZ EMPIECE DE USARLOS, INFORMARA AL INE Y ESTE A SU VEZ, A LAS DEMAS INSTITUCIONES NOMBRADAS, PARA QUE SE DECIDA SOBRE POSIBLES CORRECCIONES UNIFORMES EN TODOS LOS ARCHIVOS.

D. UNA INSTITUCION USUARIA INFORMARA AL INE Y A LAS DEMAS INSTITUCIONES NOMBRADAS, SOBRE SUS PLANES E INTENCIONES PARA ANALISIS, PARA DISCUTIR LAS POSIBLES LIMITACIONES DE LA INFOR-

MACION PARA EL PROPOSITO SENALADO. ESTO NO IMPLICARA, SIN EMBARGO, QUE INFORMADOS LOS PLANES Y DISCUTIDAS LAS LIMITACIONES, LA AGENCIA NO PUEDA PROCEDER AL ANALISIS SIN LA AUTORIZACION DEL INE.

E. UNA INSTITUCION USUARIA INFORMARA AL INE SOBRE SUS PLANES E INTENCIONES PARA ANALISIS, PARA DISCUTIR LAS POSIBLES LIMITACIONES DE LA INFORMACION PARA EL PROPOSITO SENALADO.

F. TODA PUBLICACION O INFORME ESCRITO EMITIDO POR UNA AGENCIA USUARIA DE LOS DATOS, RECONOCERA EN FORMATO UNIFORME A SER ACORDADA ENTRE LAS AGENCIAS NOMBRADAS, LA PARTICIPACION DEL GOBIERNO PERUANO A TRAVES DEL INE Y EL MINISTERIO DE SALUD, EN LA RECOPILACION DE LA INFORMACION Y EL DISENO DE LA ENCUESTA ESTE RECONOCIMIENTO APARECERA, INDEPENDIENTEMENTE DE SI LA PUBLICACION APARECE EN UNA SERIE DE LA INSTITUCION USUARIA O EN UNA PUBLICACION CONJUNTA O PATROCINADA POR EL GOBIERNO PERUANO.

G. PARA CONSERVAR LA ANONIMIDAD DE LOS DATOS, EL INE ELIMINARA DEL ARCHIVO, ANTES DE SU TRANSFERENCIA, CUALQUIERA INFORMACION QUE PERMITA IDENTIFICAR LA FAMILIA ENCUESTADA: QUEDARA EN EL ARCHIVO UN NUMERO IDENTIFICATORIO Y DATOS QUE PERMITEN CONOCER EL DOMINIO MUESTRAL, ZONA URBANA O RURAL, ETC. DE DONDE PROVIENE LA OBSERVACION."

4. INE'S RESPONSIBILITY TO PROVIDE THE TAPES UNDER THESE CONDITIONS IS SPECIFIED IN SECTION IV OF THE AGREEMENT, RESPONSIBILITIES OF THE PARTIES. "ENTRE LAS RESPONSIBLIDADES ESPECIFICAS DEL INE ESTAN LAS SIGUIENTES:.... (K).
PARA EFECTOS DEL SEGUIMIENTO DEL ANALISIS, PROPORCIONAR CINTAS DE DATOS REVISADOS A CADA AGENCIA DONANTE BAJO LAS CONDICIONES SENALADAS EN LA SECCION V, DISPOSICION ESPECIAL."

5. PLEASE TRANSMIT ABOVE (PARAS 1-4) TO PHIL MUSGROVE (PAHO), ROBERTO CUCCA (WORLD BANK), AND JOHN MCKIGNEY. COPIES OF AGREEMENT WILL BE POUCHED TO LAC/DR/HN.
ORTIZ

RECEIVED
SEP 15 1983
LAC/DR/HN

UNCLASSIFIED

Annex II

Sampling Plan

ANEXO 11

ENCUESTA NACIONAL DE NUTRICION Y SALUD

DEFINICION DE DOMINIOS DE ESTUDIO CON LA POBLACION DE LOS RESULTADOS PRELIMINARES DEL CENSO DE 1,981

DOMINIOS DE ESTUDIO	POBLACION		
	URBANA	RURAL	TOTAL
LIMA METROPOLITANA	4'608,010	-	4'608,010
COSTA NORTE	1'879,000	446,000	2'325,076
Tumbes	82,000	22,000	103,839
Piura	698,000	202,000	899,693
Lambayeque	527,000	147,000	674,442
La Libertad	572,000	75,000	647,102
COSTA CENTRO	946,000	256,000	1'202,612
Ancash	276,000	44,000	320,387
Lima	333,000	115,000	448,328
Ica	338,000	96,000	433,897
COSTA SUR	250,000	59,000	309,339
Arequipa	72,000	27,000	98,727
Moquegua	71,000	13,000	83,640
Tacna	106,000	20,000	125,972
SIERRA NORTE	293,000	1'197,000	1'489,778
Piura	20,000	206,000	226,172
Cajamarca	165,000	672,000	837,023
La Libertad	57,000	259,000	315,847
Amazonas	51,000	60,000	110,736
SIERRA CENTRO	1'213,000	1'528,000	2'742,200
Ancash	155,000	343,000	497,902
Lima	81,000	52,000	132,952
Huancavelica	99,000	248,000	346,797
Ayacucho	182,000	321,000	503,392
Huánuco	110,000	294,000	404,396
Pasco	123,000	37,000	160,483
Junin	463,000	233,000	696,278
SIERRA SUR	1'237,000	1'457,000	2'688,044
Arequipa	512,000	96,000	607,853
Moquegua	5,000	13,000	17,970
Tacna	8,000	8,000	16,113
Puno	279,000	611,000	890,258
Cusco	342,000	490,000	832,504
Apurimac	84,000	239,000	323,346

DOMINIOS DE ESTUDIO	POBLACION URBANA	RURAL	TOTAL
SELVA ALTA*	337,000	624,000	961,107
Cajamarca	46,000	162,000	208,546
Amazonas	32,000	112,000	143,824
San Martin	180,000	140,000	319,751
Junin	37,000	119,000	155,960
Pasco	9,000	44,000	52,642
Huánuco	33,000	47,000	80,384
SELVA BAJA*	373,000	306,000	679,044
Loreto	252,000	231,000	482,829
Ucayali	105,000	58,000	163,208
Madre de Dios	16,000	17,000	33,007
TOTAL	11'135,010	5'874,000	17'005,210

NOTA: *Selva Alta y Selva Baja formarán un solo dominic cada uno.
Se presentan los datos según población urbana y rural, sólo por razones veferenciales.

Lima, Julio de 1,983.

Annex III

Participation of PAHO in Design and Execution of Household Survey

PAN AMERICAN HEALTH ORGANIZATION

Pan American Sanitary Bureau, Regional Office of the

WORLD HEALTH ORGANIZATION

525 TWENTY-THIRD STREET, N.W., WASHINGTON, D.C. 20037, U.S.A.

CABLE ADDRESS: OFSANPAN

TELEPHONE 861-3200

IN REPLY REFER TO: DEC/63/5.3.3

18 May 1983

Mr. John D. North
Acting Director
Population, Health and Nutrition Dept.
The World Bank
1818 H Street, N.W.,
Washington, D. C. 20433

Dear Mr. North:

Please refer to your letter of 10 May 1983, inviting our staff member, Mr. Philip Musgrove, to join a working group formed by members of your staff, USAID, and CDC Atlanta, to conduct a study on health and nutrition issues and possible initiatives in this field in Peru.

Since this study corresponds to an area of high priority for Peru and the Pan American Health Organization, and it is very much in line with our ideas of collaboration between our two organizations, I am pleased to approve Mr. Musgrove's participation in this study.

Mr. David de Ferranti may contact Mr. Philip Musgrove and Dr. Jose Salazar in order to make the administrative arrangements required.

Sincerely yours,

Carlyle Guerra de Macedo
Director

Annex IV

Draft Questionnaire

The draft questionnaire (in Spanish) is available
from the principle investigators upon request.

Annex V

Curriculum Vitae of Consultant

AVI DOR

Residence
1 West 30th Street
New York City, N.Y. 10001

Mailing Address
104-60 Queens Boulevard
#6G
Forest Hills, New York
11375

Telephone: (212)594-5163
Messages: (212)459-3357

Birthdate: 16, September
Birthplace: ISRAEL

EDUCATION

CUNY - Graduate Center, Ph.D. Program in Economics, Areas of specialization: Economics of Human Resources, International Economics Applied Econometrics — 9/81 - prese

Columbia University - School of International Affairs. — Fall 1976

CUNY - Queens College, B.A. in Economics; Minor Political Science. Cum Laude. Completed degree in 2½ years. — Graduated 19

Forest Hills High School. Completed 10th, 11th and 12th grade in two years with honors. — Graduated 19

EXTRACURRICULAR ACTIVITIES AND AWARDS

United States: Tutor, English and Math, Queens College (1972-73)

Israel: (Until 1971) Givatayim Award for best written essay, Tel-Aviv, Actor Theatron Lilach, Tel-aviv; Counsellor, Israel Youth Movement, Tel-aviv

MILITARY SERVICE

Israel Defense Forces. — 1977 - 1980

Economist/Budgeting Officer — 1977 - 1978
Unit of Financial Advisor to the Chief of Staff, Logistics Budgets Section.

Other duties remain confidential

EMPLOYMENT

CUNY - Lehman College. Adjunct Lecturer. — Fall 1981 - Present
Courses taught to date include Introductory Macro, Intermediate Micro, Industrial Organization and Public Finance.

GRW Technologies, New Jersey. Presently employed in vendor sourcing. Use of Microdata computers (Part-time).

Avi Dor
104-60 Queens Boulevard #6G
Forest Hills, New York 11375

EMPLOYMENT Cont'd

Consulate General of Israel/Permanent Mission of Israel to the United Nations. Clerk. Duties are confidential. 1980 - 19

Member of Israel Information Services
Duties include lecturing on a wide range of topics relating to Israel. Also occasional fundraising. 1980 - 19

Israel Aircraft Industries. (New York City) 1976 - 19
Assistant Buyer for expediting.

FOREIGN LANGUAGES

Fluent in Hebrew and English. Working knowledge of French. Limited knowledge of German.

REFERENCES

CUNY - Professor Michael Grossman
Professor Salih Neftci
Professor Alvin Marty

GRW Technologies - Dr. Jacob Gesthalter

Annex VI

Data Documentation

Following discussions with Messrs. Meeraus and Pal of DRDSU it was decided that the data to be collected are potentially rich enough to warrant detailed documentation. This documentation should facilitate future secondary analysis by researchers currently not involved in the project. It should also facilitate the matching of the current data with those of a provider survey, and with the data to be collected for the informal sector employment study in Peru.

The documentation activities will be preceded by basic data checks, the preparation of abstract tapes, etc. This will reduce the need for consultant/researcher assistance services during the first stage of the process. Consequently, we anticipate that no additional resources are needed for these important activities.

The following memorandum gives details, plus a budget.

THE WORLD BANK / INTERNATIONAL FINANCE CORPORATION

OFFICE MEMORANDUM

To : Mr. J. van der Gaag, DRDEI

From : S. Pal, DRDSU SP

Extension : 61044

Date : Feb 22, 1984

Subject : Data Documentation for the Research Project "Health care Demand and Resource Mobilization: The Case of Peru"

1. Based on my experience in doing similar work in the past, I have made the following estimates for the resources needed for documentation of the Peruvian data collected and used for the reseach project.

2. The documentation process for the data collected in the health and nutrition survey will consist of two stages.

Stage 1 : (immediately after receiving the data tapes from Peru)
The tasks involved will include preparing data documentation abstracts, assembly of technical documents, registering data tapes and making back-up copies, recoding of characters if necessary, reformatting of data files according to the needs of the project. In addition, some basic checks and counts (e.g., checking completeness of survey questionnaire for a particular household, counts of records of various types, etc.) will be performed as well. Some consulting services will be offered to the research assistants for further processing and analysis of data.

Stage 2 : (at specific intermediate times during the course of the study)
As the project continues, the documentation will have to be periodically updated to accommodate the results of consistency checks and data corrections, assessment of data quality, etc. Periodic maintenance of the data tapes will also be necessary to ensure usability of the data tapes.

3. Documentation of the survey of providers of health care will follow a similar course, but the time and costs will be less compared to those for the health and nutritions survey, because the data set is expected to be smaller in size and less complex in structure.

4. The following table summarizes the estimates.

Documentation of Health and Nutrition Survey

	Consultant	Computer	Total
Stage 1	6 weeks	$2,500	
Stage 2	2 weeks	$1,000	
	--------	-------	
total	8 weeks	$3,500	$11,500

Documentation of Survey of Providers of Health Care

	Consultant	Computer	Total
Stage 1	1 week	$500	
Stage 2	1 week	$500	
	--------	-------	
total	2 weeks	$1,000	$ 3,000

Total Costs for Documentation	$14,500

cc and cleared with : A. Meeraus, DRDSU

FORM NO. 1889
(9-88)

evaluated

WORLD BANK RESEARCH PROGRAM
COMPLETION REPORT

PROJECT'S CLOSING DATE: 12/31/87

DATE OF SUBMISSION OF COMPLETION REPORT: ~~10/31/88~~ 11/8/88

I. PROJECT IDENTIFICATION

1. TITLE
Health Care Demand and Resources Mobilization: The Case of Peru

PREPARED BY: J. van der Gaag

2. PROJECT NUMBER:	3. DEPARTMENT:	4. DIVISION:
673/38	Population & Human Resources	Welfare & Human Resources

5. STAFF PARTICIPATION:

(a) Principal Supervisor(s):* J. van der Gaag (3/85)

(b) Others Responsible:

(c) Administrative/Budgeting Officer: Brenda H. Rosa

6. CONSULTANT(S) (list names, nationalities, and affiliations):
Avi Dor, Israeli - Long-term consultant at Bank
Paul Gertler, American - Harvard School of Public Health
Ruben Suarez, Peruvian - in business on own account.

7. OTHER OUTSIDE COLLABORATOR(S) (list names, nationalities, and affiliations):

RAD COPY

RPO 673-38

II. DEPARTMENTAL APPROVAL

DIVISION CHIEF'S NAME (Please type):	SIGNATURE:	DATE:
J. van der Gaag		10/31/88
DEPARTMENT DIRECTOR'S NAME (Please type): Ann O. Hamilton	SIGNATURE: Ann O. Hamilton	DATE: ~~10~~/4/88 11

* If changed indicate date(s).

III. FUNDING ($ thousands)

FISCAL YEAR	RESEARCH SUPPORT BUDGET AUTHORIZATIONS			BANK		OUTSIDE		TOTAL
	Initial (1)	Supplementary (2)	Total (3) = (1) + (2)	Department (4)	Amount* (5)	Organization (6)	Amount (7)	(3) + (5) + (7)
FY 84	9.2		9.2	PHN	- 2.7			6.5
FY 85	116.0		116.0					116.0
FY 86	45.3		45.3					45.3
FY 87	11.3		11.3					11.3
FY								
TOTAL	181.8		181.8					179.1

IV. ACTUAL EXPENDITURES ($ thousands)

FISCAL YEAR	RSB PROJECT NO. 673/38 (1)	BANK* (2)	OUTSIDE (3)	TOTAL (1) + (2) + (3)
FY 84	0.4			0.4
FY 85	91.9			91.9
FY 86	19.7			19.7
FY 87	46.1			46.1
FY 88	15.2	15.1		30.3
TOTAL	178.3	15.1		193.4

APPROVED BY RESEARCH ADMINISTRATOR (print name)	SIGNATURE	DATE
Dennis de Tray		

*Do not include staff time cost equivalent in these columns.

V. OUTPUT AND DISSEMINATION

1. REPORTS - Publications and reports from project (please provide full references for each.)

Health Care Demand and Resource Mobilization (RPO 673/38)

Output
LSMS Working Paper Series

(1) No. 35. Dor, Avi and Jacques van der Gaag. "The Demand for Medical Care in Developing Countries." May 1987.

(2) No. 37. Dor, Avi, Luis Locay, Warren Sanderson, Paul Gertler, and Jacques van der Gaag. "Health Care Financing and the Demand for Medical Care." May 1987.

(3) No. 31. Suarez-Berenguela, Ruben M. "Financing the Health Sector in Peru". April 1987.

(4) No. 45. Gertler, Paul and Jacques van der Gaag. "Measuring the Willingness to Pay for Social Services in Developing Countries. May 1988.

(5) Gertler, Paul and Jacques van der Gaag. "The Willingness to Pay for Medical Care, (book manuscript). October 1988. This has been given to the Publications Committee for review.**

LSMS No. 35 is forthcoming in the Journal of Health Economics.

LSMS No. 37 comprises two reports, one of which has been published in the Journal of Econometrics and other is forthcoming in the Journal of Health Economics.

2. DISSEMINATION - Seminars, Conferences, Training Sessions (topic, date, location, and participation).

Seminars were presented in the Bank to regional and economic staff and the papers were presented at professional conferences both in the US and in Europe.

*Indicate with asterisks the project's principal reports. Provide the Research Administrator's office with one copy of each of these reports. Additional copies may be requested if the project is later subject to evaluation by the Research Committee.

VI. OBJECTIVES AND RESULTS

In the following section, please briefly summarize the results of the project in relation to its objectives, using additional space as necessary. The narrative should be organized according to the points listed below.

1. What general questions did the study seek to answer? What answers did it find? How significant are these answers for a) development policy in general? b) Bank operations?

2. To what extent did the study fulfill its objectives? Did the objectives change as the study was undertaken? If yes, why?

This project examined the impact of user fees on the demand for health services in rural areas of two developing countries. The study looked for answers to such questions as: How would the use of health services be affected by new fee policies: Would users shift from some types of health care providers to others? Would some user groups fare better or worse than others? Would there be differences by type of health service: How much in additonal resources would be mobilized?

Some researchers have hypothesized that factors other than price, particularly perceived quality of care, dominate in household health care choices and that existing fees for public health services could be raised substantially without appreciably affecting use. To test this hypothesis it is necessary to know how price sensitive the demand for medical care is, and how this price sensitivity differs by socioeconomic group. A major part of the research has therefore been devoted to generating reliable estimates of price elasticities of demand, including the influence of non-price factors such as quality of services, costs other than fees (time and travel), health status and socioeocomic factors such as income and education.

The study used data from the Living Standards Measurement surveys conducted in Côte d'ivoire and Peru in 1985. (See RPO 673/22 and 673/26). A theoretical model was developed to explain the health care providers choice of individuals who suffered from an illness or injury. The estimation results were surprisingly similar, despite the fact that both economies have very different health care systems. Based on the estimation results, the consequences of alternative price and reinvestment policies were simulated in various settings to illustrate how rational decisions can be reached based on the trade-off between cost recovery and protecting the poor. The criteria for judging the feasibility and desirability of user fee policies were: The potential for raising revenues; changes in patterns of use of medical care; and the effects on welfare, especially for the poor.

Continued

Findings and Implications for Policy

- The demand for medical care is price sensitive, but much more so for the poor than the rich.

The revenue potential of user fees is low in poor areas, high in wealthier areas. User fees approaching the marginal costs of care will effectively price the poor out of the market, but do not substantially deter residents of wealthier villages from using medical care. Both from the point of view of cost recovery and of equity, therefore, some sort of price discrimination is necessary. Since targeting the poor for price discounts may be administratively difficult, geographic discrimination (charging lower prices for facilities that primarily serve lower-income groups) may be an answer. Fees should be introduced gradually, guided by evaluation of resulting impacts on patterns of use of medical care.

- Child care is more price elastic than adult care.

Imposing or raising user fees will harm children's health and welfare more than adult's. It would make good economic and humanitarian sense (as well as being logistically simple) to exempt child care from increases in the fee structure for medical care, or at least to differentiate between fees for child and adult health care.

- Alternative health care providers are closer substitutes than self care.

Charging fees for higher levels of care (for instance hospitals) generally causes individuals to move to other types of care rather than to drop out of the medical care market. This result suggests that it would be worth experimenting with higher charges for higher levels of care, carefully monitoring the effect on demand for medical care overall and adjusting accordingly.

The general message to policy makers is thus one of gradation and differentiation. User fees could significantly increase resources needed to improve the health system. If they are introduced selectively, and special measures are being taken to protect the poor, the policy can at the same time improve the equity of the system. But if no special measures are taken, a user fee policy will perpetuate the inequitable distribution of health care in the developing world.

The findings call for a reevaluation of the Bank's current stand on user fees for social sector financing. It is currently being scheduled that in cooperation with the PHR divisions in the regions and the other divisions in the PHR Department, workshops will be organized to draw the implications of the results for project and programs in the social sector.

The project set out to be a case study of just Peru. Unfortunately the data scheduled to be used for this project were not available on time. Fortunately LSMS data sets for both Peru and Côte d'Ivoire turned out to be rich enough to answer the main questions of this project. As a consequence we obtained results from two very different countries which facilitates the generalization of the policy conclusions. In the end we did obtain the original data set that should have formed the basis for the project. We currently are in the process of analyzing these data in the hope that they confirm as well as supplement our main findings.

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LSMS
Living Standards
Measurement Study
Working Paper No. 35

The Demand for Medical Care in Developing Countries: Quantity Rationing in Rural Côte d'Ivoire

Avi Dor
Jacques van der Gaag

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The Demand for Medical Care in Developing Countries: Quantity Rationing in Rural Côte d'Ivoire

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LIVING STANDARDS MEASUREMENT STUDY

The Living Standards Measurement Study (LSMS) was established by the World Bank in 1980 to explore ways of improving the type and quality of household data collected by Third World statistical offices. Its goal is to foster increased use of household data as a basis for policy decision making. Specifically, the LSMS is working to develop new methods to monitor progress in raising levels of living, to identify the consequences for households of past and proposed government policies, and to improve communications between survey statisticians, analysts, and policy makers.

The LSMS Working Paper series was started to disseminate intermediate products from the LSMS. Publications in the series include critical surveys covering different aspects of the LSMS data collection program and reports on improved methodologies for using Living Standards Survey (LSS) data. More recent publications recommend specific survey, questionnaire and data processing designs, and demonstrate the breadth of policy analysis that can be carried out using LSS data.

ABSTRACT

Several authors have pointed out the implications of financing medical care from general public funds. Among these are Akin (1986), Birdsall (1986), Jimenez (1986) and de Ferranti (1985). The most authoritative treatment of this issue is given in "Financing Health Services in Developing Countries: An Agenda for Reform, (World Bank, 1987). A common theme in the discussion is that user fees can improve efficiency and the prospects for cost recovery, while maintainig current levels of equity. In order to evaluate this arguement, it is necessary to assess the responsiveness of consumers to changes in the price of medical care. Little evidence from developing countries exists to date.

In this paper we attempt to fill the gap by analyzing the demand for health care in the rural Cote d'Ivoire where user fees are zero, but private access costs may be substantial. Using a mixed discrete choice/continuous demand analytical framework, we show that the absence of user fees <u>per se</u> does not guarantee equal access to all consumers. Private costs, represented by travel time, result in non-price rationing similar to the conventional money price mechanism. Our results strongly suggest that if revenues obtained from user fees are used to improve the regional distribution of services, the resulting system may actually improve equity over the long-run.

ACKNOWLEDGEMENT

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Introduction

Besides the social desirability of improving health, the health status of the population is relevant to the economic development of a country for two reasons: First, as an indicator of economic development, it shows the ability and success or failure of a country to provide for the most basic needs of the people (food, adequate sanitary conditions, shelter). The correlation between such crude indicators as child mortality and life expectancy on the one hand, and per capita income on the other, is very robust and has been extensively documented (e.g. Preston 1975, 1980; WDR, 1984).

Secondly, health - as a form of human capital - is an input for the further development of a country. There is ample evidence to suggest that health plays an important role in school enrollment and school performance of children (see for instance, Edwards and Grossman 1979, Bartel and Taubman 1979, Cooper and Rice 1976) and in labor supply and productivity of adults (Berkowitz et al. 1983, Grossman 1975, Grossman and Benham, 1974) and on earnings (Luft, 1976). Furthermore, high infant and child mortality rates are among the most important factors related to high fertility rates, which in turn play a crucial role in development.

Life expectancies as low as 38 years at birth may be found in the poorest among developing nations such as Guinea and Somalia. [1/] In middle income countries which include Côte d'Ivoire, life expectancies average 55 for males and 58 for females. In comparison most developed countries have attained life expectancies well above 70 years of age. Similar disparities exist in infant mortality rates. The highest infant mortality rate in the

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[1/] 1982 figures.

world exists in Afghanistan where 205 of every 1,000 live born infants die during the first year of life. In the majority of developing countries exhibit infant mortality rates in excess of 90 infants per 1000, compared with average of 10 in the industrial market economies.

In light of the above it is not surprising that improving the population's health features as a major goal on the agendas of many local and national governments in less developed countries (LDCs). Although many other factors are relevant for achieving this goal (adequate food supplies, sanitation, education), providing medical care to those who need it plays a central role in improving health.

It is usually quickly recognized that a pure market approach to providing medical goods and services is unlikely to produce satisfactory results. The general arguments for some form of government intervention and regulation are well known. In some cases, health-care is a pure public good (air quality control, general anti-epidemic campaigns), in other cases large externalities exist (inoculations against contagious diseases). And where medical care can be identified as a private good, a market approach may lead to outcomes that are judged to be unacceptable on equity grounds. Add to this: Allegedly widespread consumer ignorance, the need for quality control, the scarcity of private funds for investments in human capital (medical education) and in non-human capital (hospitals), and a heavy government hand in the health-care sector can easily be explained. Indeed, in industrialized countries as well as in LDCs, the health care sector is without exception among the most extensively regulated industries.

In LDCs, government intervention in the health-care sector has often lead to a system that provides medical care free-of-charge or for a price that bears little resemblance to the marginal cost of the service or product. General revenues serve as the major source of financing. Revenues from user charges usually contribute less than 10 percent of recurrent expenditures (Ainsworth, 1983, de Ferranti, 1985).

Unfortunately, in their quest to provide medical care free-of-charge or at very low cost, governments have sacrificed the availability of care in order to maintain affordability. Public budgets have been proven to be insufficient for providing adequate care to the majority of the population. Though other factors have also played a role, it seems fair to say that the combination of highly subsidized care and insufficient general funds has lead to a general structure of the health care sector that has the following characteristics:

(i) Quantity rationing has taken the place of the price mechanism. Where financial resources are insufficient to finance a health-care system that meets the need of the population, effective demand is constrained by the sheer lack of medical facilities, personnel and drugs.

(ii) Available supply is unequally distributed, with a strong urban bias. In many LDCs, doctors, nurses and hospital beds are concentrated in the cities, in spite of the fact that the vast majority of the population lives in rural areas.

(iii) Modern curative care ("high-technology" hospitals, "western" doctors) has won the battle over scarce resources, leaving little to finance preventive activities and basic care. This is particularly damaging in LDCs where the leading causes of death are infectious and parasitic diseases. Many of these diseases can be prevented or treated adequately with relatively cheap and simple techniques.

(iv) With barely enough resources to cover salaries and the most basic drugs, there is no money left for equipment or for maintenance of the existing facilities. Consequently, available resources are used inefficiently (doctors without equipment) and the limited amount of medical care that is provided, is generally of low quality.

Growth projections for most of the developing world are not optimistic (WDR 1985, 1986) and many LDCs are coping with IMF-type austerity programs and World Bank-type structural adjustments that usually put severe constraints on the government budget.

In recent years, there has been a growing awareness of the need to find new sources of finance in order to expand social services in developing countries and in some cases avert their virtual collapse. Whereas funds for capital investments are often available through international donors the public sector must find new ways to finance operating and maintenance costs, i.e., recurrent costs. Much of the discussion focuses on the usefulness of user fees in the health care sector. (Birdsall 1983, de Ferranti 1985). In most developing countries there appears to be a political consensus in favor of free medical care. In Côte d'Ivoire this is manifested in a presidential commitment not to impose fees on medical services.

The discussion on how to finance medical care no longer questions the need to search for resources other than general public funds. Rather, the focus is on where and how to introduce so called "user fees", i.e. charges to those who actually use the medical services. 1/ The benefits of this option go well beyond revenue raising <u>per se</u>. First of all, if goods and services are priced adequately (i.e. are set equal to their marginal costs), society will allocate it's scarce resources efficiently. For instance, simple measures of preventive medical care are likely to get higher priority under a marginal cost-pricing scheme, because the cost of a unit of preventive care is well below that of a unit of curative care. Furthermore, when prices are zero, there is excess demand for certain goods and services, a situation that can be remedied by the introduction of user charges.

The strongest argument in favor of the current policy to provide medical care free-of-charge (or at very low cost), is that it promotes equal access by eliminating financial barriers. However, given the distorted regional distribution of facilities, the policy does not result in an equitable health care delivery system. In fact, the policy tends to be regressive with most beneficiaries living in the higher income urban areas.

Nevertheless, the introduction of user fees into a system that is currently providing goods and services free-of-charge raises many questions regarding both the efficiency and the equity of the system. Among them:

1/ For a discussion of other options (.e.g. many variants of risk sharing) see de Ferranti 1985.

(i) For which goods and services are fees desirable? Should the fee be equal to the marginal cost of the product? Can the marginal cost be measured? Should the fee be high enough to recover all cost, or should certain services be subsidized?

(ii) Though money prices are currently zero, the private cost of obtaining medical care can still be substantial. Travel time is often very long and the monetary cost of traveling can be a substantial outlay for poor families. How can user fees be introduced without making the total cost of obtaining medical care prohibitively high?

(iii) Many studies show high income elasticities for medical care. Will poor families be able to pay the price, if money fees are to be set high enough to recover a substantial part of the total cost?

In this paper we will make a start with answering some of these questions. Our focus will be on current health care utilization patterns in rural Côte d'Ivoire. We will investigate the extent of <u>quantity rationing</u> for medical services provided by doctors and nurses, by estimating own and cross time-price elasticities for these services. We will also look at the corresponding income elasticities.

In the next section we will present background information on the health-care system in Côte d'Ivoire. In Section 3 we present the anayltical framework used, as well as descriptive statistics on health status and health care utilization. The data stem from the Ivorian Living Standards Survey. In Section 4 we present the estimation results for adults, infants and children. Section 5 summarizes the main results and draws policy conclusions.

II <u>Background Information on Côte d'Ivoire</u>

2.1 The Health Care System

In order to provide a general background for the analysis presented in the subsequent sections, we now present some general information on the economy and the health care system in Côte d'Ivoire. Since independence (1960), The Côte d'Ivoire has seen a steady economic growth, from a level of \$145 per capita in 1960 up to \$1,207 in 1980, [1/] the high point of its economic development. During this period crude health indicators improved significantly. The infant mortality rate decreased from 167 in 1960 to 119 in 1982, while life expectancy at birth increased from 39 to 47 years (Table 2.1). Still, these indicators are little better than those prevailing in neighboring West African countries which are much poorer, and they compare unfavorably to those of an "average" lower middle income country.

Large differences of health exist within the country. In Abidjan life expectancy was estimated at 56 years in 1979, compared with only 39 years in the rural Savanna regions , and 50 years in the urban Savanna regions. Child mortality rates in rural areas exceed those in Abidjan were twice as high as child mortality prevailing in rural areas.

Part of these differences are likely to be related to the unequal distribution of welfare in The Ivory Coast. Based on the value of total household consumption [2/] only 3.3 percent of those in the lowest quintile live

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1/ All dollar equivalents are in current values for the relevant years.

2/ Total Household consumption is measured as the sum of cash expenditures on consumption goods, plus the value of home grown produce consumed by the household.

in Abidjan, while 45.7 percent of "the poor" live in the Savanna area (Table 2.2). Just 3.9 percent of "the rich" live in the Savanna, while 42.8 percent of them live in Abidjan. [1/] This large, urban-rural welfare gap is paralleled by the distribution of health care facilities.

TABLE 2.1: Health Indicators for Côte d'Ivoire and Lower Middle Income Countries (averages)

	Côte d'Ivoire		Lower Middle Income	
	1960	1980	1960	1980
Crude Death Rate	24	17	20	12
Infant Mortality Rate	167	119	114	89
Child Mortality Rate	40	23	28	13
Life Expectancy at Birth	39	47	45	56

SOURCE: The Côte d'Ivoire Country Economic Memorandum, the World Bank, 1986.

TABLE 2.2: The Regional Distribution of Welfare in Côte d'Ivoire Consumption Quintiles, Percentages.

		QUINTILES				
	Total	1	2	3	4	5
Abidjan	18.8	3.3	5.2	13.2	29.2	42.8
Other Cities	22.4	7.0	18.1	28.2	27.1	31.8
Rural East	24.7	35.2	35.4	22.5	19.9	10.6
Rural West	15.2	8.8	19.6	21.9	14.9	11.0
Rural Savanna	18.9	45.7	21.8	14.1	9.0	3.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

SOURCE: Glewwe (1987)

1/ For a more extensive assessment of the distribution of welfare in the Côte d'Ivoire see Glewwe (1987).

About 40 percent of the population in Côte d'Ivoire lives in urban areas. Abidjan alone accounts for a population of 1.6 million, or about 17 percent of the total of 9.3 million (1983). All major hospital facilities are in the cities. The two university hospitals (about 1300 beds in total) are situated in Abidjan, while the five regional hospitals (general hospitals with a capacity of about 275 beds) are found in the cities of Bouaké, Man, Daloa, Abengourou and Korogho. Together these hospital facilities account for 41 percent of all beds. Rural areas are served by small local hospitals, maternity and child care units, dispensaries and mobile health units.

The hospital sector employs 70 percent of all doctors, 45 percent of all midwives and over 50 percent of all nurses. About 60 percent of all doctors are based in Abidjan. The overall health manpower situation is unbalanced. In 1983 there were about 600 doctors, 2200 nurses and 1000 midwives, but virtually no skilled auxiliary Workers. 1/ Given the current health manpower training system, the World Bank projects that the number of western doctors will increase from 6.5 per 100,000 population in 1983 to 7.8 in 2000. The number of nurses per capita will increase from about 24.9 to 26.5. Thus, the already low nurse/doctor ratio of 3.8 will further decrease to about 3.4.

All health workers are paid by the government. Medical care is, in principle, provided free of charge. For 1984 the government health budget was

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1/ There is also an unknown number of traditional healers. Furthermore there are about 7000 "journaliers" working in the health care sector, ranging from gardeners and chauffeurs to laboratory assistants and X-ray machine operators. Most of them are unskilled or received informal training only.

32.6 billion CFAF, or 6.8% of the total budget. [1/] More than 75 per cent of this budget is for personnel cost, about 8 percent for drugs and the rest for materials, equipment, maintenance and other operating cost. Current manpower projections indicate that the total health budget will soon be insufficient even to cover personnel cost only, unless the budget grows much faster than other parts of the government budget, or unless other financial resources are found.

The general quality of the existing facilities leaves much to be desired. A 1979 study showed that of the 309 dispensaries, one third was more than 20 years old, only 19 percent had piped in water and just 21 percent had a working water pump. Pharmaceuticals are in short supply and two thirds of the dispensaries, which are supposed to serve as referral centers, lack any means of transportation. Of the 126 Maternal-Child Health Care units (MCH), 45 percent had no water and 31 percent no electricity. Only 20 percent are able to provide preventive services and general health education, though these tasks are supposed to be part of the workload of all MCHs. The two university hospitals in Abidjan have occupancy rates well in excess of 100 percent, but most of the hospitalized patients are just waiting for the arrival of necessary drugs and other supplies and/or for the repair of equipment. In one university hospital two of the six ORs have not been used during the past three years because basic equipment is broken and funds are lacking for replacement.

In light of the above, it is not surprising that there is increasing pressure to search for alternative ways to cover the recurrent costs of the

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1/ Recurrent budget only.

Ivorian health care system. The subsequent analysis aims at providing results that will help to make informed decisions regarding this issue.

2.2 Health Status as Reflected by The Ivorian Living Standards Survey

The ILSS which is discussed in detail in Section 3.2 enables us to go beyond the generally available mortality and life expectancy data. It contains information about morbidity, such as the incidence and severity of illness in the population, which is given below by age, sex and geographic location. The weakness of these data is that they are based upon subjective assessments of own states of health.

In terms of self reported health status, about 30 percent of the individuals interviewed by the ILSS reported to have suffered from an illness

TABLE 2.3: Percentage of Individuals who Report an Illness or Injury during the past four Weeks; by Location, Age and Sex

	Abidjan			Other Cities			Villages			Ivory Coast		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	30.73	35.22	33.19	30.26	29.93	30.10	32.08	30.05	31.15	31.48	30.98	31.26
6-15	21.99	20.05	20.98	23.03	20.60	21.84	20.63	19.89	20.28	21.43	20.98	20.27
16-35	26.41	32.93	29.86	27.06	31.57	29.70	23.97	26.81	25.61	25.58	29.40	27.69
36-49	40.80	40.32	40.56	44.80	44.59	44.69	46.08	42.27	43.70	44.60	42.40	43.32
50+	32.05	42.00	35.94	57.52	51.22	54.24	54.80	55.73	55.26	52.77	53.09	53.32
Total	27.81	30.79	29.36	30.37	30.77	30.57	30.99	31.21	31.11	30.26	31.03	30.67

or injury during the four weeks prior to the survey (Table 2.3) 1/. No major sex differentials exist, but there is a distinct age profile. Young children (0-5) show an incidence of illness and injury equal to the overall average, while older children (6-15) show the lowest incidence rate. Adults (16 and over) show a monotonous increase of illness with age.

Table 2.4 reflects the anticipated decline in health associated with age: mean restricted activity days increase with age. The mean restricted activity days in rural areas is 7.7 for males and 8.7 for females compared with little over five days in urban areas. Thus, while the incidence of self-reported health problems appears to be higher in the cities, health problems are on average more severe in rural areas.

TABLE 2.4: Mean Number of Restricted Activity Days During the Past Four Weeks; by Location, Age and Sex

	Abidjan			Other Cities			Villages			Ivory Coast		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	5.57	4.46	4.93	4.73	5.38	5.04	6.11	6.31	6.21	5.74	5.74	5.74
6-15	3.90	4.03	3.97	3.82	3.57	3.71	5.08	4.83	4.96	4.56	4.36	4.46
16-35	3.60	5.52	4.72	3.68	5.63	4.78	7.53	7.32	7.40	5.37	6.40	5.98
36-49	3.88	8.48	6.11	4.47	7.06	5.87	7.50	7.45	6.47	6.07	7.51	6.90
50+	8.36	10.29	9.24	10.17	7.73	8.97	10.97	12.47	11.71	10.66	11.53	11.09
Total	4.45	5.63	5.09	4.95	5.64	5.31	7.52	7.88	7.71	6.40	6.96	6.69

1/ For the sake of completeness, we present data on individuals who live in Abidjan, Other Cities, and the Villages. Most of our discussion, however, will focus on rural areas, i.e. the Villages.

Table 2.5 shows the distribution of visits to formal health workers i.e. doctors nurses and midwives. Since obstetric care is included in the table it is no surprise that prime age females usually obtain more medical care than prime age males. In the oldest cohort, where obstetric care is no longer relevant the reverse occurs: elderly females obtain less formal care than elderly males, with the exception of Abidjan. Although the elderly are less healthy than younger adults, they tend to consume less medical care, particularly in rural areas.

TABLE 2.5: Percentage of Individuals with an Illness or Injury Who Obtained Medical Care (From Doctors, Nurses or Midwives)

	Abidjan			Other Cities			Villages			Ivory Coast		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	68.25	68.97	68.67	69.57	60.25	65.00	46.26	41.91	44.36	54.36	51.44	52.99
6-15	50.68	61.64	56.16	50.45	52.08	51.21	41.94	40.85	41.43	45.60	47.64	46.56
16-35	53.95	62.20	58.72	53.85	57.49	55.89	39.59	47.33	44.27	47.52	53.88	51.26
36-49	60.78	68.00	64.36	62.50	59.09	60.66	45.39	38.89	41.46	52.42	47.29	49.48
50+	60.00	47.62	54.35	52.31	46.03	49.22	32.30	31.21	31.76	37.53	34.70	36.14
Total	57.45	63.54	60.77	57.05	55.63	56.32	40.59	40.10	40.33	47.30	47.95	47.64

This straight forward presentation of the data clearly illustrates the severity of health problems in The Ivory Coast. Roughly one-third of the population is ill during any given 4-week recall period, and on average, those who are ill loose about one-quarter of their time due to the illness.

III. Analytical Framework and Data

3.1 Analytical Framework

Only a handful of studies of household demand for health care exist to date. The majority of studies has focused on the discrete choice problem of choosing among alternative providers. These include Gertler et al. (1986), Mwabu (1986), Birdsall and Chuhan (1986), Akin et al. (1985 and 1986) and Heller (1982). A conventional analysis of the amount of care demanded, measured by medical expenditures or number of consultations is found in Musgrove (1981) and Heller (1982). Musgrove found that income effects in Latin America are substantially higher than income effects in developed countries. 1/ In general, the literature has not been able to show that money prices affect utilization. However, Gertler et al. using a model in which price effects depend on income show that health care demand is highly elastic with respect to prices for low income groups, but that the price effect diminishes as income increases.

1/ Income elasticities in the various Latin American countries tended to concentrate around unity. Income elasticities not exceeding 0.3 are commonly found in the developed countries. This is shown to be the case for the number of health care visits by individuals (van de Ven and Van der Gaag, 1982, Acton, 1975), by the household (Holtman and Olsen, 1978) and for aggregates of the population (Benham and Benham, 1975). Similar results were obtained for health care expenditures by individuals (Phelps, 1975). Income elasticities of demand for pediatric care tend to be considerably higher, as shown by Colle and Grossman (1978).

As we mentioned earlier, travel time is expected to be a particular powerful rationing devise in poor countries, where the majority of the population inhabit rural areas and health infrastructures are concentrated in the cities. Furthermore, Acton (1975, 1976) has shown that when money prices are low, time becomes the dominant rationing mechanism. Past studies in developing countries have not been able to confirm this, primarily due to data limitations. The main purpose of this paper is to identify the impact of travel time and other economic variables on health care utilization in rural Côte d'Ivoire, where medical services are rendered free of charge.

In order to address this issue we define a general health care demand function.:

$$M = M(P, Y, H, Z)$$

with M the demand for medical care

P a vector of prices, including time prices

Y a measure of income

Z a vector of socioeconomic variables

H a measure of health capital

Throughout this paper we will first look at the determinants of market entry, i.e. we analyze the question of who obtains medical care in case of an illness or injury. M, the demand for medical care, is thus defined as a zero-one dummy variable. We adapted the standard logit model for this part of the analyses. Secondly, we estimate a provider choice model that gives the probabilities of seeking care from a doctor or a nurse, relative to not seeking care at all. [1] We use the multinomial logit model for this step of the analyses. Finally, we analyze the number of consultations with each provider using a two step estimation procedure that corrects for the selectivity bias that stems from the fact that a positive number of consultations is only observed from those who have chosen a particular provider. [2]

3.2 Data and Summary Statistics

A. The Ivorian Living Standards Survey

The data used in this study are drawn from the Ivorian Living Standard Survey (ILSS). This multi-purpose household survey, which aims at measuring many socioeconomic factors relevant to the living standards of Ivorian households, was started in February 1985. [3] During the first 12 month period, 1588 households will be interviewed, of which 950 were located in rural areas. Approximately 93 percent of these households are farming households. Detailed information on health-care utilization is obtained from all household members who reported an illness or injury during the four weeks prior to the interview. The ILSS also contains extensive information on many socioeconomic aspects relevant to the demand for medical care.

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[1] The alternative of seeking care from a traditional healer is ignored (see Appendix A).

[2] For a more explicit description of the econometric specification see Appendix B.

[3] For detailed information on this survey, see Grootaert, 1985.

The ILSS also contains extensive information on many socioeconomic aspects relevant to the demand for medical care. In this study we use total household consumption ("income") as a measure of the household's economic well-being. Variables such as age, sex and years of schooling are also included as exogenous variables.

Health status is indicated by an individual's own assessment of whether or not he suffered from an illness or injury during a 28-day recall period. Recall that Table 2.3 shows the percentage of the population that report an illness during this period. Of the 30 percent reporting an illness, about 57 percent obtained some form of formal or traditional health care. Figure 1 depicts the distribution of care by type of practitioner. While more than half of those who obtained medical care in Abidjan consulted a doctor, in the villages only 17 percent saw a doctor. Still fewer rural dwellers consulted a traditional healer (11 percent), while the majority of rural dwellers consult a nurse (58 percent). Information on medical consumption includes the number of visits to each type of provider, expenditures on consultations (if any) and expenditures on drugs.

In addition to household data, the ILSS collects community level information in rural areas. The rural component of the household survey was comprised of 56 sample clusters, which roughly correspond to small villages. However, the community survey was completed in only 52 rural clusters. Relevant to the current study is the data on the availability of various types of health care facilities. Travel time is reported for the nearest available facility of each type (hospital, clinic, maternity center, etc.). When a provider is available in the village, travel time is recorded as zero.

HEALTH PRACTITIONER CONSULTED BY RESIDENCE

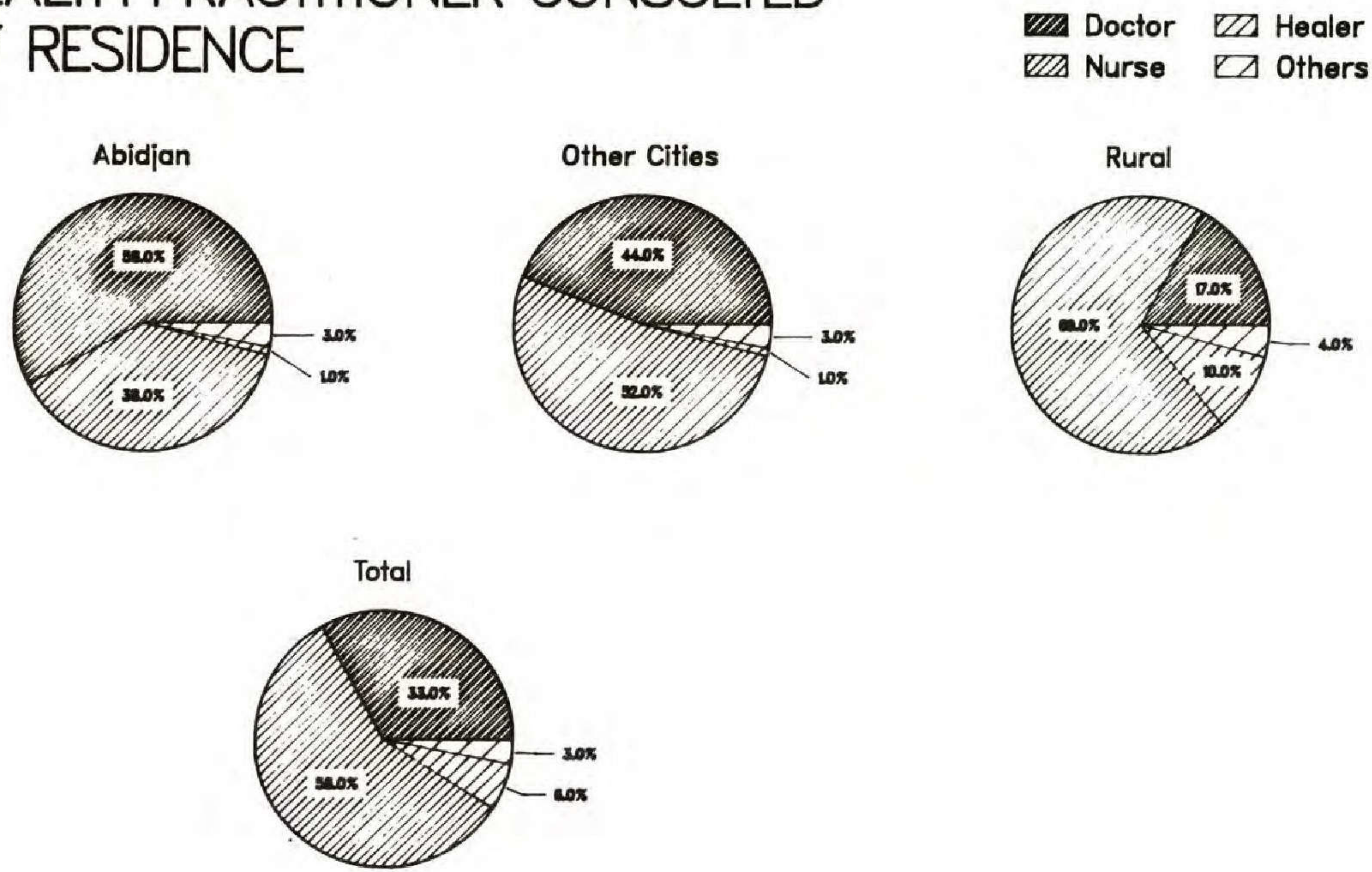

Figure 1

B. The Rural Sample and Variables

The rest of this study deals strictly with the rural segment of the population. Summary statistics for adults (everyone over 16 years of age) are shown in Table 3.1; summary statistics for infants (under 6) and toddler (6-15) are shown in Table 3.2. In three out of the 52 clusters (villages) travel time to sources of health care was not known. Since the analysis presented here draws heavily on travel time information these clusters were deleted from the sample. Of the remaining 49 clusters, only 12 had a nurse, and none had a medical doctor.

All of the individuals in the sample belong to one of 665 households interviewed in these clusters. The overwhelming majority of households, i.e. 637, was headed by males. The mean age of heads of households is 48.87 (s.d. = 13.96) and their mean years of schooling is only 1.05 (s.d. = 2.50).

Demographic variables such as age, education, sex, and the composition of the household (number of adults and number of children) enter the model in a simple linear fashion. Non-linearities in age were accounted for by dividing the sample into age groups. The education variables are years of schooling in the adult sample and years of father's schooling in the younger age groups. Educational attainment is typically low and there is little variation in schooling. Approximately 83 percent of the adults had no education, with the remainder ranging from 1 to 12 years of schooling. In the combined child sample, about 87 percent had fathers with no education, while less than 2 percent had fathers with more than 10 years of schooling. Since there is even less variation in mother's schooling, this variable was not included in the estimation. Whether a person chooses a doctor or a nurse should also depend on certain preconceptions or cultural biases of the decision-maker. Such prejudices will not effect the amount of health care obtained once a provider has been selected. Cultural biases in favor of one type of health provider and against another may be expressed as a function of a person's nationality, ethnic group, religion or tribal affiliation. Our sample was almost strictly Ivorian, and unfortunately the remaining variables were not available (future LSMS surveys will incorporate such variables). We opted for a regional dummy variable (Savanna) as a proxy for cultural differences. This variable only enters the discrete choice models.

An individual's health status is measured by the number of days during the past four weeks that an individual was not restricted in his normal activities. For adults and older children this is obtained by subtracting the number of days someone was restricted by an illness or injury from the 28 day recall period. In the case of infants, for whom this information is not available, we use 28 minus reported sick days. This variable is expected to reduce the probability of seeking medical care.

It is important to note that elderly persons typically have more sick time than prime age adults; they can expect a certain number of restricted activity days to be their normal state. This implies that an elderly person would require a relatively large number of restricted activity days in order to motivate an initial visit to a health practitioner. Thus, the anticipated positive effect of restricted activity days on the probability of seeking medical care should decrease with age. Conversely, the positive effect of unrestricted days on the probability of seeking medical care is likely to increase with age (i.e. become less negative). For this reason we include an interaction term between our health measure and age, in the adult discrete choice models. In the case of children, we will assume that the valuation of the child's health will depend on the assessment by the parents rather than on the child's own assessment. Therefore we included an interaction of health and the father's education in the "child" discrete choice model.

Once a person selects a health care provider, healthiness is likely to affect the number of medical consultations in opposite directions. On the one hand, the healthier the person the fewer the number of consultations needed. On the other hand relatively healthier patients are better equipped to undertake trips to their preferred provider. In order to see which of the two effect prevails, the unrestricted days variable enters the quantity demand regressions in a quadratic fashion.

TABLE 3.1: Summary Statistics
Rural Adults with Illness or Injury

SAMPLE	Ages 16 - 49		Age 50 +	
Number of persons with positive sick time	702		492	
VARIABLES	Mean	Standard Deviation	Mean	Standard Deviation
Endogenous				
Probability of obtaining formal medical Care	.43	.50	.32	.47
Probability of seeing a doctor	.10	.31	.08	.27
Probability of seeing a nurse	.32	.48	.25	.43
number of doctor consultations	31	1.46	.31	1.88
number of nurse consultations	.92	1.98	.95	2.34
Exongenous				
Travel time to doctor (in hours)	.86	.70	.92	.95
Travel time to nurse (in hours)	.56	.62	.56	.63
Income; annual household consumption (in millions of CFAF)	1.32	1.21	1.09	.96
Years of age	32.82	10.00	61.56	9.78
Sex (male = 1, female = 0)	.37	.48	.51	.50
Years of education	1.46	2.82	.12	.72
Number of adults in the household (age 16+)	5.61	4.93	5.17	3.84
Number of children in the household (age < 16)	5.66	5.71	4.36	4.39
Number of unrestricted activity days (maximum = 28)	20.60	8.56	16.06	11.05
Savanna resident (= 1 answer is yes, = 0 otherwise)	0.29	0.45	0.32	0.46

TABLE 3.2: Summary Statistics
Rural Children with Illness or Injury

SAMPLE	Ages 0 - 5		Age 6 - 15	
Number of persons with positive sick time	429		380	
VARIABLES	Mean	Standard Deviation	Mean	Standard Deviation
Endogenous				
Probability of obtaining formal medical Care	.46	.50	.43	.50
Probability of seeing a doctor	.08	.27	.07	.24
Probability of seeing a nurse	.38	.49	.36	.48
number of doctor consultations	.19	.95	.17	.79
number of nurse consultations	1.02	1.89	.96	1.81
Exogenous				
Travel time to doctor (in hours)	.74	.64	.79	.81
Travel time to nurse (in hours)	.46	.58	.43	.57
Income; annual household consumption (in millions of CFAF)	1.40	1.26	1.41	1.20
Years of age	2.41	1.60	9.52	2.70
Sex (male = 1, female = 0			.52	.50
Years of education of father	1.05	3.12	.79	2.55
Number of adults in the household (age 16+)	5.57	4.96	5.19	4.34
Number of children in the household (age < 16)	6.67	5.50	6.73	5.52
Number of unrestricted activity days (maximum = 28)	21.92	7.52	22.88	6.80
Savanna resident (= 1 if answer is yes = 0 otherwise)	0.21	0.41	0.23	0.42

IV. Estimation of Demand for Health Care

4.1 Estimation Results for Adults

A. Entry to the Health Care Market

In order to quantify the effect of the exogenous variables on the probability of seeking medical care, we estimated a market-entry equation in Logit form for all persons with positive sick time (the dependent dummy variable equals one if the person consulted a medical practitioner). In Table 4.1 we present the estimation results for prime age adults (i.e. for persons between the ages of 16 and 49), for elderly persons, age 50 or above, and finally for the pooled adult sample. The coefficients(the β's) are reported with asymptotic t-values. Throughout this paper, the marginal effects are also reported for all dichotomous regressions. A formal derivation of the slope term is given in Appendix A.

In all the regressions in Table 4.1, the age variable has the expected negative effect and it is statistically significant in the elderly and pooled samples. We also ran the pooled regression with quadratic and splined age terms but this did not improve the results. 1/

1/ Age splines turned out to be significant in some of the child care regressions. All of the pooled models for children under the age of 16 presented here include an age spline.

TABLE 4.1: Determinants of Decision to Seek Medical Care in Case of Illness (Logit)

	Prime Age Adults (Age 16 - 49)			Elderly (Ages 50 +)			All Adults		
	β	T	Marginal effect	β	T	Marginal effect	β	T	Marginal effect
Constant	2.76	(3.36)	0.676	3.69	(2.99)	0.792	2.59	(5.50)	0.610
Average travel time	0.38	(2.37)	-0.090	-0.36	(2.06)	-0.076	-0.36	(3.03)	-0.081
Income	0.24	(2.86)	0.059	0.13	(0.93)	0.027	0.20	(2.69)	0.048
Age	-0.05	(2.60)	-0.013	-0.07	(3.61)	-0.015	-0.05	(5.79)	-0.011
Male	0.00	(0.02)	0.001	0.15	(0.73)	0.032	0.04	(0.29)	0.011
Education	-0.01	(0.30)	-0.003	-0.03	(0.18)	-0.006	-0.02	(0.61)	0.009
Adults	-0.08	(2.04)	-0.020	-0.01	(0.19)	-0.002	-0.06	(2.30)	-0.014
Children	0.03	(1.46)	0.008	0.07	(1.79)	0.016	0.04	(2.01)	0.010
Unrestricted days	-0.15	(3.33)	-0.035	-0.20	(2.03)	-0.043	-0.11	(5.36)	-0.026
Unrestricted days x Age	0.002	(1.97)	0.0005	0.003	(2.79)	0.001	0.002	(4.00)	0.0004
Savanna	-0.15	(0.72)	0.036	0.42	(1.65)	-0.090	-0.25	(1.60)	-0.058
Log likelihood	-444.65			-286.64			-737.76		
χ^2	70.16			48.81			119.04		
Income elasticity	0.183			0.095			0.156		
Travel time elasticity	-0.149			-0.181			-0.154		

The measure of healthiness, i.e. the number of unrestricted activity days has a significantly negative impact on utilization overall. Just as anticipated, this effect is dampened somewhat at old age. The positive sign of the healthiness and age interaction reveals that ceteris paribus, an older person requires relatively fewer healthy days (i.e. more sick days) in order to have the same probability of seeking health care as a younger person.

Since home care which is normally provided by adults, is viewed as a substitute for formal medical care, the number of adults in the household is expected to reduce the probability of seeking formal care. Since adults in the extended households must also devote a certain portion of their time to child care, the number of children in the household is likely to increase the probability of seeking care. Estimation results confirm our expectations. The household size variables always have the anticipated sign and are usually significant.

The remaining demographic variables appear to be less important determinants of market entry. Living in Savanna areas has a negative impact on market entry in all age categories, but is significant at a 10% level only in the elderly category. Sex and education do not have any effect on the decision to seek health care.

With the exception of health status, economic variables are the most important determinants of health care utilization. Individuals living in households with a relatively high income, show ceteris paribus a significantly larger probability of seeking care than their poorer counterparts. The income elasticity of the pooled sample, for instance, is 0.17 (at the sample means) comparable to the results usually obtained for industrialized countries, but well below the unit income elasticities obtained by Musgrove (1984). 1/

The travel time variable was obtained by averaging travel time to the nearest doctor and travel time to the nearest nurse. Perhaps the most important result is found with respect to this variable. The estimation

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1/ Note that Musgrove's estimates refer to health care expenditures while the current analyses deals with the probability of seeking care.

result implies a time-price elasticity ranging from -0.24 to -0.34 [1/] at the sample means. Thus we were able to confirm the proposition that in the absence of money prices, other private costs of obtaining medical care play the role of the conventional price mechanism.

It should be stated here that, even though actual fees for medical care are zero, total out-of-pocket expenditures are likely to be positive due to transportation costs. Unfortunately, information on the money cost of travel that is associated with the consumption of medical care was not available in the survey.

The goodness of fit criterion χ^2, which is given in Table 5.1, is based on the general log likelihood ratio of the form

$$LR = L^*(\hat{\beta})/L^*(0).$$

$L^*(\hat{\beta})$ is the value of the maximized log likelihood using the estimated parameters and $L^*(0)$ is the maximized log likelihood function under the null hypothesis that all β's are equal to zero. It can be shown that $-2 \bullet \ln(LR)$ is approximately distributed as a χ^2_k (chi-squared), where k degrees of freedom are equal to the number of zero restrictions (Wilks, 1962). Throughout this study, χ^2 statistics are sufficiently large to reject the null hypothesis that the estimated β's are equal to zero.

1/ Comparable estimation procedures are found in Coffey (1983). The time-price elasticity reported there, of entry into the medical care system for low income females in Texas is virtually identical to the above results.

Finally we tested the validity of pooling across age groups. To do this we used another approximation to the χ^2 test, also known as the Wald test.

$$\chi^2 = [\beta_1 - \beta_2] [V_1 + V_2]^{-1} [\beta_1 - \beta_2]'$$

Where β_1 is the parameter vector belonging to prime age adults, β_2 is the parameter vector from the elderly regression and V_1, V_2 are the respective variance matrices. The result was 15.4, well below the 95 percent critical level of 19.7. Consequently we cannot reject the null hypothesis that $\beta_1 = \beta_2$, hence pooling is appropriate.

Before showing how the above results hold up when other models of demand for health care are estimated, concerns about selectivity bias should be mentioned. Although data was available for all persons who completed the interview, the estimating sample excludes all healthy people. To see whether this severely biases the sampled data, the Probit demand equation was estimated conditional upon the probability of being ill or injured. The procedure (due to van der Ven and van der Praag, 1981) yielded small changes in the coefficients and virtually no change in the slopes. Therefore it was concluded that no severe selection bias arose due to the exclusion of health persons.

B. Provider Choice, a Multinomial Logit Model

In the previous section we analyzed the decision to seek medical care in case of an illness or injury: when ill, an individual either obtained some form of medical care or obtained no care at all. In table 3.3 of the previous section we saw that for all rural adults who obtained medical care, the average number of visits to a doctor is .34 and to a nurse 1.14. In this section we first analyze this choice of health-care provider: to visit a doctor or a nurse, relative to not obtaining medical care at all. Then we will turn our attention to the number of consultations with each of these providers.

We specify a multinomial logit model of the following form:

$$\ln (P_j/P_o) = \sum_{k=1}^{2} \beta_{jk} T_{jk} + \gamma_j Z$$

with

P_j	The probability of choosing provider j
j = 1	Doctor
j = 2	Nurse, and
T_{jk}	Travel time to a given provider
Z	Composite of socioeconomic variables
β_{jk}, γ_j	The corresponding coefficients for choice j

P_o is the default option, i.e. it is the probability of not seeking care when ill, with coefficients normalized to zero. Thus, $\ln(P_j/P_o)$ is the logarithm of the probability of consulting provider j, relative to the probability of not seeking care at all. The composite Z contains the same exogenous variables as in the previous section. The T_k variables denotes travel time, and may be interpreted as choice-related price variables. Note that travel time for the "don't go" option is equal to zero.

It is easy to see that the log-odds ratio of any two alternatives depends on all choice related variables and on traits of the decision maker which are common to all choices. Thus the multinomial logit does not exhibit the Independence from Irrelevant Alternatives (IIA) property (see McFadden, 1981).

The interdependence of all alternatives is reflected in the elasticity of P_j with respect to X_k, where X_k represents any of the exogenous variables.

$$E_{jk} = (\beta_{jk} - \sum_{j=1}^{2} P_{jk}\, \beta_{jk})\, X_k$$

From the above, one may calculate own time-elasticities ($j = k$), cross time elasticities ($j \neq k$), or elasticities with respect to a trait of a decision-maker (replace β by γ). A derivation of various elasticities is given in Appendix B.

Estimation results are given in Table 4.2A. Time prices are represented by the time needed to travel to the nearest doctor and travel time to the nearest nurse. All own time-price effects have the expected negative sign. In the doctor alternative the coefficient is -1.95 with a t-value of 4.03. In the nurse alternative there is a highly significant negative own time-price effect of -0.20. In both alternatives cross time effects are positive and significant at the 0.99 significance level. These results suggest that in Côte d'Ivoire the services of nurses and doctors are substitutes, rather than complements.

The income effect in both alternatives is positive and significant. Income and travel time elasticities are given in Table 4.2B.

The Multinomial Logit Model strongly confirms and augments the results obtained from the simpler bivariate model: own time-price effects are negative, cross time-price effects are generally positive. The magnitude of these effects is substantially greater than those found by Akin et al. in the Philippines (1981, 1986).

We finally note that the impact of socioeconomic variables are generally stable across the entry-to-the-market and provider choice models. In particular, the coefficient of age is negative and highly significant. The sex effect (of being a male) is negative an insignificant in the nurse alternative, but positive and significant in the case of doctor visits. This indicates that males are more likely to obtain higher quality health care. These results are not compatible with the notion drawn from the standard utility model framework such as Acton's, that individuals with higher opportunity costs of time (e.g. working-age adult males) demand less medical care. Furthermore, negative age effects were not predicted by either variant of the Grossman (1972) household production model. The results of this study suggest that individuals who are relatively more productive obtain the largest share of medical care in the household.

An implicit assumption in the above model is that the probability choice set of an individual includes all prices and is therefore analogous to the conventional demand function. This type of probability choice set is found in Small and Rosen (1981). It differs from the Random Utility Maximization (RUM) framework described in McFadden (1981).

TABLE 4.2A: Multinomial Logit Model of Provider Choice Determinants of Choice between Doctor, Nurse, and Home Care Adults in Rural Areas with an Illness or Injury

	Nurse Alternative		Doctor Alternative	
	β	t	β	t
Constant	2.125	(4.23)	2.135	(3.39)
Doctor travel time	0.325	(3.38)	-1.953	(4.03)
Nurse travel time	-0.887	(5.57)	1.028	(2.31)
Income	0.234	(2.84)	0.259	(2.86)
Age	-0.048	(5.46)	-0.050	(4.54)
Male	-0.043	(0.29)	0.439	(1.95)
Education	-0.042	(1.54)	0.010	(0.21)
Adults	-0.054	(1.99)	-0.080	(1.99)
Children	0.039	(1.73)	0.053	(1.49)
Unrestricted days	-0.106	(4.81)	-0.130	(4.46)
Unrestricted days x Age	0.002	(3.86)	0.001	(2.52)
Savanna	0.093	(0.53)	0.407	(1.31)
Log likelihood	-967.49			
X^2	198.66			

TABLE 4.2B: Income and Travel Time Elasticities of the Probability of Choosing a Doctor or Nurse

	Nurse Alternative	Doctor Alternative
Income elasticity	0.183	0.214
Travel time elasticities		
Nurse	-0.385	1.082
Doctor	0.310	-1.075

The current multinomial model can be made to conform with RUM by imposing zero restrictions on cross price effects. [1/]

$$\ln(P_j/P_o) = \beta_j T_j + \gamma_j Z$$

The log odds ratio will not exhibit IIA in any strict sense, since it will always depend on Z, the person trait(s) common to all alternatives. [2/] As in the unrestricted case income elasticities of each alternative incorporates income effects of all other alternatives.

On the other hand alternatives are independent with respect to time prices. The own-time elasticity becomes:

$$E_j^{P_j} = \beta_j T_j (1 - P_j)$$

As in the case of binary logit, the cross elasticity of the probability of alternative j with respect to travel time to alternative m is:

$$E_m^{P_j} = - \beta_m T_m P_m$$

1/ Note that this is computationally identical to a conditional-logit model where socioeconomic variables are interacted with alternative specific dummy variables.

2/ As McFadden (1982 p. 11) states: "... it is not the MNL form per se, but rather the restriction of [the dependent variables] to depend only [our emphasis] on attributes of [alternative] i, that implies the IIA restriction".

It is immediately obvious that the model does not allow for complementarities. Furthermore, cross elasticities of any number of alternatives with respect to price or time of some other alternative m are always constrained to be equal. 1/

In practice, the restricted version of the multinomial logit model is not expected to yield significant changes in the coefficients of the socioeconomic variables. This is not so in the case of travel time variable where actual and spurious correlations (the correlation between the nurse and doctor travel times was 0.61) may have biased the estimates in the unrestricted model.

Results of the restricted version of the multinomial logit model are given in Table 4.3A. As anticipated the coefficients of the various socioeconomic variables remain fairly stable compared with the previous MNL model. There is no significant change in the own-time effect in the nurse alternative. In the doctor alternative, the coefficient of travel time was reduced by nearly one half.

New elasticity estimates on the basis of the restricted model are presented in table 4.3B. Although the all own-time and cross-time effect have decreased in absolute values, the basic results of both MNL versions are the same. The t-values tend to be slightly higher in the restricted model. However, the unrestricted model does better in term of goodness-of-fit criteria. Since both models were estimated on the same sample and with the

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1/ This does not present a problem in the trinomial case. However, if we were able to add a fourth alternative, say healers, this would imply that the cross-price elasticity of doctor visits with respect to healers and the cross price elasticity of nurse visits with respect to healers are always equal.

TABLE 4.3A: Restricted Multinomial - Logit Model
All Adults

	Nurse Alternative β	Nurse Alternative t	Doctor Alternative β	Doctor Alternative t
Constant	2.28	(4.46)	2.180	(3.44)
Doctor travel time			-1.160	(4.35)
Nurse travel time	-0.658	(4.89)		
Income	0.202	(2.48)	0.255	(2.32)
Age	-0.047	(5.31)	-0.032	(4.68)
Male	-0.061	(0.42)	0.046	(2.07)
Education	-0.073	(1.54)	-0.002	(0.30)
Adults	-0.053	(1.95)	-0.077	(1.79)
Children	0.038	(1.71)	0.039	(1.11)
Unrestricted days	-0.102	(4.67)	-0.129	(4.44)
Unrestricted days x Age	0.002	(3.69)	0.001	(2.49)
Savanna	0.035	(0.20)	-0.280	(0.93)
Log likelihood	-966.73			
X^2	180.18			

TABLE 4.3B: Income and Travel Time Elasticities

	Nurse Alternative	Doctor Alternative
Income elasticity	0.154	0.219
Travel time elasticity		
Nurse	-0.261	0.107
Doctor	0.072	-0.953

same set of alternative, their likelihood ratios are directly comparable. We can thus construct a likelihood ratio test for the null hypothesis that cross-time coefficients are zero.

$$\chi^2 = -2\bullet\ln\left(\frac{L(\hat{\beta}_2)}{L(\hat{\beta}_1)}\right)$$

$\hat{\beta}_1$ denotes the coefficients from the unrestricted model, while $\hat{\beta}_2$ denotes the coefficients from the restricted model. The test yielded a χ^2 value of 1.4, compared with $\chi^2_{22,.010} = 42.0$. Consequently the null hypothesis of zero cross-time effects can not be rejected.

C. Number of Consultations with Doctors and Nurses

In this section we turn to the actual "quantity" of care demanded, measured by the number of visits to each type of provider. Demand is estimated conditional on entering the health care market, i.e. for all individuals with positive visits. In order to correct for sample selection bias we used a two step procedure described in Section (3.1). The selection term was generated from the restricted MNL estimates, which were drawn from the pooled adult sample. Consequently the quantity-demand equations were also estimated from the pooled sample.

Table 4.4A shows results obtained from both OLS and the two-step procedure. Selection terms in both the nurse alternative and the doctor alternative were not significant (implying that selectivity bias does not arise) and differences between the parameter vectors of the OLS and two step procedures were minor.

The coefficients of all the demographic and health variables display the same signs in both the doctor and nurse alternatives. However, these variables matter more in the doctor alternative where they are more significant and larger in magnitude. The demographic variables with the greatest impact on doctor consultations are the number of adults and the number of children in the household. There is a negative association between the number of adults and utilization and a positive association between the number of children and utilization. Since the interpretation is the same as in the previous provider choice model, we need not discuss it here.

While the education variable had no effect on the decision to chose a doctor, it has a significantly negative effect on the amount of doctor consultations. This result is compatible with the notion that more education makes people more efficient at "home production" of health and therefore it reduces the amount of medical care required (Grossman, 1972).

It is also interesting to note that being a male has a significantly positive and large effect on the number of doctor consultations, and a negligible effect on nurse consultations. The provider choice model indicated that males are more likely to obtain health care provided by doctors and less likely to obtain care provided by nurses. If indeed doctors provide higher quality health care then these results imply that households bias their allocation of health care in favor of males.

Although the economic variables, i.e. travel time and income fail to attain critical t-values with the exception of the own-time parameter in the nurse alternative, the results do confirm and augment conclusions drawn from the provider choice model. Negative own time effects and positive cross time effects indicate that travel time replaces the conventional price mechanism and that medical care provided by nurses and medical care provided by doctors are indeed substitutes. Since selectivity bias did not arise, income and travel time elasticities reported in Table 4.3B are based on OLS estimates.

TABLE 4.4A: Demand For Medical Consultations
OLS and Two-Step Estimates
(ADULTS)

	Nurse Alternative				Doctor Alternative			
	β	T	β	T	β	T	β	T
Constant	2.275	(5.62)	1.96	(3.75)	2.010	(3.06)	1.402	(1.66)
Doctor travel time	0.149	(1.10)	0.143	(1.03)	-0.737	(1.01)	-0.813	(1.11)
Nurse travel time	-0.267	(1.67)	-0.232	(1.54)	0.550	(0.84)	0.687	(1.04)
Income	0.141	(1.66)	0.106	(1.25)	0.150	(0.97)	0.112	(0.71)
Age	0.007	(1.17)	0.010	(1.51)	0.002	(0.25)	0.010	(0.86)
Male	0.095	(0.68)	0.088	(0.68)	0.501	(1.68)	0.436	(1.70)
Education	-0.033	(0.83)	-0.028	(0.40)	-0.092	(1.50)	-0.089	(1.99)
Adults	-0.039	(1.19)	-0.031	(0.87)	-0.164	(2.36)	-0.150	(2.01)
Children	0.059	(2.34)	0.052	(1.97)	0.130	(2.44)	0.122	(2.30)
Unrestricted days	0.021	(0.66)	0.028	(0.88)	0.083	(1.64)	0.107	(1.95)
(Unrestricted days) 2/	-0.002	(1.64)	-0.002	(1.61)	-0.003	(1.58)	-0.003	(1.77)
Selection term			1.810	(0.98)			2.918	(1.54)
R^2	0.102		0.105		.103		0.124	
F value	3.600		3.37		1.250		1.400	
Sample size	330 a/				109			

a/ Excluding observations with more than 7 consultations.

TABLE 4.4B: Elasticities of Quantity Demand
(Adults, Conditional Upon Market Entry)

	Nurse Consultations	Doctor Consultations
Income elasticity	0.075	0.098
Travel-time elasticities		
Nurse	-0.043	0.066
Doctor	0.051	-0.155

These estimates apply strictly to the conditional sample of entrants to the health care market and not to the whole population. Section V considers the full market response to economic variables.

4.2 Demand for Child Health Care

A. Entry to the Health Care Market

Our analysis of health care utilization on behalf of children follows the sequence laid out in the previous section, namely the market-entry decision, a provider choice model and finally the demand for consultations. Initially, the sample of children was divided into two age groups: infants or toddlers under the age of six, and children between ages six an fifteen. The test for pooling previously described indicated that pooling these age groups may not be appropriate in the binary market-entry regressions but is acceptable in the multinomial logit model of provider choice. 1/

As in the analysis of adult health care we begin this study by first posing the question, what determines whether an ill or injured child will obtain health care, not distinguishing between the various types of health workers sought. Table 4.5 shows results for all age categories, including the pooled category.

The vector of independent variables in the child regressions is similar to the vector independent variables in the adult regressions, but there are several important differences. In order to control for non-

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1/ In the binary case the Wald test yielded a statistic of 29.7, in the multinomial case the test statistic was 39.9.

linearities in the age effect, we introduced an age spline representing the effect of additional years beyond the age of five. This variable turned out to be statistically significant an it improved the overall fit of the model. The age spline shows that infant and toddlers are less likely to obtain medical care as they get older, whereas in later years the overall effect of age is positive. Another change in the use of years of education of the father instead of own-education. The father's education was preferred over the customary mother's education in the light of trial regressions (OLS and Logit) which included either one of these correlated variables. The coefficients consistently turned out to have the same sign, although father's education usually possessed a higher asymptotic t-value.

The healthiness measure of children under the age of six is not unrestricted activity days but rather the number of healthy days during the four-week recall period. As was stated earlier, we assume that the adults decision-makers in the household determine the threshold of sick days which justify entry into the child health care market. Therefore, we interact a proxy for adult tastes, namely the father's education, with the health variable.

A number of socioeconomic variables has the same impact as in the adult population. In particular, the number of adults in the household reduces the probability of obtaining medical care, while the number of children increases this probability. Although the relative healthiness does not seem to matter in the case of children between ages six and fifteen, it remains as a significant negative determinant of market entry in the aggregated sample. Similarly, there are no significant differences between the probabilistic market entry elasticities of children and adults. The income elasticities of the aggregated adult sample and the aggregated child samples are 0.16 and 0.13. Their respective travel time elasticities are 0.15 and 0.30. It is interesting to note that travel time has the same impact on infants as on prime age adults, perhaps reflecting the fact that parents or certain other adults in the household necessarily devote some of their own time in order to obtain medical care for the child.

B. Provider Choice Model

As was mentioned above, test statistics allow us to pool the two age groups in the provider choice model. 1/ Separate MNL regressions for the two subsamples revealed that education and the education-health interaction were the only variables with different signs across age groups. Therefore, we allow the parameters of these variables to vary by age group in the pooled MNL regression.

Tables 4.8A shows the results of the provider-choice model on behalf of children, which is analogous to the restricted MNL model in Section (4.1). The parameters in the nurse alternative are generally more significant than the parameters in the doctor alternative, probably due to the differences in the sample size, in each alternative. Nevertheless, certain parallels emerge across these alternatives. As in the adult provider choice model, travel time is the major determinant of utilization. On the other hand the income parameter, while positive in both alternatives, does not attain

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1/ Another reason for pooling is the small number of observations with positive utilization of doctor services. Only fifty-nine children under the age of sixteen were seen by doctors, compared with 165 infants and 137 older children who were seen by nurses.

TABLE 4.5: Determinants of Decision to Seek Health Care Infants and Children (LOGIT)

	Infants			Older Children			All Children		
	β	T	Marginal Effect	β	T	Marginal Effect	β	T	Marginal Effect
Constant	1.62	(3.77)	0.40	-0.07	(0.61)	-0.018	1.18	(3.56)	0.291
Average total time	-0.95	(4.13)	-0.237	-0.83	(3.44)	-0.202	-0.86	(5.31)	-0.22
Income	0.21	(2.02)	0.053	0.10	(0.85)	0.025	0.16	(2.06)	0.040
Age	-0.20	(3.06)	-0.050	0.01	(0.28)	(0.003)	-0.17	(3.27)	-0.043
Age spline (age > 5)							0.22	(2.84)	0.053
Male	-0.01	(0.04)	-0.002	0.02	(0.15)	0.005	0.08	(0.05)	0.003
Education	-0.10	(1.08)	-0.025	0.56	(1.49)	-0.136	-0.03	(0.34)	-0.007
Adults	-0.09	(2.36)	-0.023	-0.12	(2.32)	-0.030	-0.11	(3.42)	-0.026
Children	0.06	(1.91)	0.015	0.12	(3.14)	0.030	0.09	(3.65)	0.022
Unrestricted days	-0.04	(2.94)	-0.011	-0.01	(0.41)	-0.002	-0.03	(2.57)	-0.007
Unrestricted days x father's education	-0.01	(1.52)	0.001	-0.02	(1.58)	-0.006	0.00	(0.33)	0.003
Savanna	0.22	(0.79)	0.054	-0.12	(0.42)	-0.029	0.06	(0.29)	0.014
Log Likelihood		-271.26			-239.22			-515.68	
X^2		49.95			40.01			80.79	
Income elasticity		0.161			0.086			0.128	
Travel time elasticity		-0.310			-0.298			-0.299	

TABLE 4.6A: Multinomial Logit Model of Provider Choice (Children)

	Nurse Alternative β	Nurse Alternative t	Doctor Alternative β	Doctor Alternative t
Constant	1.218	(3.17)	0.596	(0.913)
Doctor travel time			-2.102	(4.02)
Nurse travel time	-1.243	(6.81)		
Income	0.154	(1.78)	0.293	(2.13)
Age	0.262	(3.96)	-0.090	(0.78)
Age spline (age > 5)	-0.261	(3.16)	0.117	(0.79)
Male	0.054	(0.34)	-0.325	(1.12)
Adults	-0.110	(3.32)	-0.071	(1.18)
Children	0.097	(3.65)	0.016	(0.35)
Father's education a/	0.059	(0.65)	-0.292	(1.02)
Unrestricted days a/	-0.037	(2.86)	0.042	(2.00)
Unrestricted days x Father's education a/	0.004	(0.94)	0.011	(0.94)
Fathers education b/	0.590	(1.53)	1.633	(1.22)
Unrestricted days b/	-0.013	(0.98)	-0.042	(1.90)
Unrestricted days x Father's education b/	-0.249	(1.59)	-1.100	(1.06)
Savanna	0.435	(2.05)	-1.123	(1.79)
Log likelihood	-637.83			
X^2	158.00			

a/ Specific to infants less than 6 years of age.
b/ Specific to children age 6-15.

TABLE 4.6B: Income and Travel Time Elasticities From Provider Choice Model (All Children)

	Nurse	Doctor
Income Elasticity	0.121	0.316
Travel Time Elasticities		
Nurse	-0.348	0.208
Doctor	0.005	-1.055

critical t-values. A comparison of tables 4.3B and 4.6B shows that travel time elasticities in the sample of children are generally higher than travel time elasticities of adults. However, the basic results remain the same: own-time effect are negative and large, the absolute value of own-time elasticities in the doctor alternative exceed unity and cross-time effects are always positive but small. Although income effects are consistently positive in the provider choice models, there are certain differences between the two samples. In the adult sample the elasticities of the nurse and doctor choices were quite similar (0.12 and 0.19 respectively).

In the children sample the income elasticity of the nurse choice was very small (0.12) while the income elasticity of the doctor choice was relatively high (0.32). Recall that higher income elasticities in the doctor alternative consistently appeared in the adult models as well. A possible explanation is that although health services are nominally free, there are certain costs of higher quality care (i.e. doctors) which are not observed by the researcher. Consequently, income is a more important determinant of utilization of high quality medical services.

C. Number of Consultations with Doctors and Nurses

The demand equations for nurse and doctor consultations were estimated with OLS and the two step procedure previously described. Results are given in Table 4.7A. Since the sample size in the doctor alternative is very small, we will not pay much attention to the demand equation in this alternative. The selection term was not significant in either case and the parameter estimates in the two-step method are not significantly different from the OLS estimates. For convenience, the following discussion will refer to the conditional sample of market entrants, namely to the OLS regressions. The demand equation in the nurse alternative suggests that relatively healthier children tend to obtain a greater amount of medical care. The negative sign of the quadratic healthiness term implies that the positive association between healthiness and utilization of nurse services is reversed when children become severely ill. This result confirms previous findings in the case of adults.

Given a child's state of health, demand is dominated by economic variables rather than demographic traits. Travel time and income elasticities are given in Table 5.7B.

As in all of the previous cases, travel time effects had the expected signs, and income elasticities are low. Note that there are minor differences between elasticities in the doctor alternative and the nurse alternative. Furthermore, a comparison of Tables 4.4B and 4.7B shows that elasticities of demand for adult consultations and elasticities of demand for child consultations are in the same order of magnitude.

The little evidence that does exist in the developed world, particularly the United States, reflects substantially higher income elasticities for pediatric health care visits compared with adults visits. Studies by Inman (1976), Colle and Grossman (1978) and Goldman and Grossman (1978) show that income elasticities of pediatric visits conditional upon positive utilization range from 0.16 to 1.32 compared with an income elasticity of 0.07 for pediatric nurse visits in Côte d'Ivoire. One possible explanation of this disparity is that since health care services are provided free-of-charge in rural Côte d'Ivoire, out-of-pocket expenditures there represent a relatively small share of income. Another possibility is that given the extended family structure, rural Ivorian households have a greater freedom to select persons with low opportunity costs of time to accompany children.

TABLE 4.7A: Demand for Medical Consultations (Children) OLS and Two Stage Procedures

	Nurse Alternative				Doctor Alternative			
	β	T	β	T	β	T	β	T
Constant	1.556	(3.57)	1.341	(2.19)	3.063	6.34	3.076	(6.32)
Doctor travel time	0.325	(2.14)	0.321	(2.19)	-0.331	(0.40)	-0.492	(0.59)
Nurse travel time	-0.764	(2.94)	-0.678	(2.17)	-0.064	(0.09)	0.096	(0.13)
Income	0.168	(1.64)	0.150	(1.64)	0.001	(0.01)	0.054	(0.34)
Age	-0.050	(0.76)	-0.027	(0.34)	-0.017	(0.16)	-0.035	(0.32)
Age spline	0.063	(0.65)	0.035	(0.32)	0.134	(0.93)	0.175	(1.18)
Male	0.166	(0.86)	0.165	(0.86)	0.003	(0.01)	-0.022	(0.08)
Education	0.033	(1.05)	0.032	(1.02)	0.021	(0.42)	0.032	(0.61)
Adults	-0.063	(1.65)	-0.048	(1.46)	-0.167	(2.16)	-0.169	(2.19)
Children	0.042	(1.35)	0.031	(0.79)	0.134	(2.07)	0.125	(1.90)
Unrestricted days	0.009	(1.94)	0.094	(2.00)	-0.142	(2.05)	-0.146	(2.11)
$(\text{Unrestricted days})^2$	-0.003	(2.30)	-0.003	(2.38)	0.004	(1.70)	0.004	(1.65)
Selection term			0.403	(0.50)			-3.66	(1.12)
R^2	0.054		0.050		0.289		0.309	
F Value	2.040		1.898		1.592		1.580	
Sample size	295 [a]				51 [a]			

[a]/ Observation with 1-7 consultations.

TABLE 4.7B: Elasticities of Quantity-Demand (Children, Conditional Upon Market Entry)

	Nurse alternative	Doctor alternative
Income elasticity	0.076	0.000
<u>Travel Time Elasticities</u>		
Nurse	-0.120	-0.030
Doctor	0.087	-0.067

V. Summary and Conclusion

5.1 Total Utilization Response

In this paper we estimated various health care demand models in order to assess the extend of quantity rationing in the health care system in Côte d'Ivoire. Quantity rationing was defined as the effect of travel time to the nearest provider on the decision to seek medical care, on the choice of the health care provider and on the total number of calculations with each provider.

We summarize our main results in Table 5.1. Note that total demand, M_j, for services of provider j is given by

$$M_j = P_j \bullet (N_j | N_j > 0)$$

where P_j is the probability of choosing j, and N_j is the number of consultations with j, only observed if j is chosen.

Thus:

$$\frac{\partial M_j}{\partial X} = P_j \frac{\partial N_j}{\partial X} + N_j \frac{\partial P_j}{\partial X}$$

for any exogenous variable X. We evaluate the total demand elasticity for provider j, E_j as

$$E_j = \varepsilon_j + \eta_j$$

i.e., the sum of the probability elasticity of demand (e.g.) and the conditional elasticity of demand for consultations.

TABLE 5.1: Total Demand Elasticities

	Nurse alternative	Doctor alternative
	Adults	
Income elasticity	0.229	0.317
Travel Time Elasticities		
Nurse	-0.304	0.173
Doctor	0.123	-1.108
	Children	
Income elasticity	0.198	0.316
Travel Time Elasticities		
Nurse	-0.468	0.178
Doctor	0.092	-1.122

The results in Table 5.1 clearly show that in the absence of user fees, travel time acts as a rationing mechanism in the health care market. It also seems appropriate to state that access to higher quality care, i.e. doctors, is always completely restricted by long travel times. On the other hand, because medical care is free, income elasticities in the Ivorian health care market are relatively low, much like they are in the developed countries in which the market for medical care is generally characterized by a high level of insurance coverage.

5.2 Policy Implications and Conclusion

The case against user fees in the health care market stems from the desire to allow everyone who needs it, free access to medical care. However, while money prices may be zero, as they are in rural Côte d'Ivoire, private costs to the patients may still be considerable. As we have shown in this paper, the absence of user fees per se does not guarantee equal access for everyone. In fact, the private costs (here represented by travel time), much like a money price, serve as a rationing mechanism, with those living farther from health care facilities being most restricted. Thus, the case against user fees can not be based on some a priori notion of equity.

Furthermore, our results imply that the demand for medical care in rural areas can be significantly increased if the regional distribution of health care providers is improved. Such an improvement could be used to offset the expected negative impact on the demand for medical care that is likely to result from the introduction of user fees. Conversely, if the new revenues obtained from user fees are being used to improve the regional distribution of providers, the resulting system can turn out to be more equitable, rather than less equitable as is usually feared.

The outcome, of course, depends on many issues that need further examination. Among them: for which medical services should fees be set; can the fees result in sufficiently high revenues for improving the system; do fees have the same impact on poor and rich households, or should fees be made income dependent?

Answers to these questions depends on the money price elasticity of demand, the willingness-to-pay for medical care and the cost structure of health care facilities. Research is under way within the World Bank's Living Standards Unit to address these issues in order to help policy makers make the difficult decisions necessary to solve the severe financial problems that are prevalent in the health care delivery systems of many LDCs.

Appendix A

A Note on Traditional Healers

There is little evidence about the role of traditional healers in developing countries. In the past it has been suggested that some indigenous forms of medicine may be effective and can be integrated into the health care system (The World Bank, 1980). The Ivorian Living Standards survey contains no data relating practices of faith healers or the types of symptoms treated by them. However, ample data on levels of utilization was collected. The data suggests that although traditional medicine is significant in the rural parts of Côte d'Ivoire, it is practically non-existent in urban locations. 1/

In rural areas 118 persons of all ages consulted a healer compared with only 9 persons in urban locations. Of the fifty villages for which community level data was collected, all but four had a traditional healer on premise. Table 7.1 shows the distribution of visits by age group and place of consultation. The largest proportion of visits occurred in prime age adults. However, after adjusting for population shares it becomes evident that there are no appreciable differences between age groups. Similarly, there are no appreciable differences between sexes (see Table 7.2). A major amenity offered by traditional healers are home visits. Roughly 40 percent of traditional health care episodes took place in the patient's home, while only

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1/ Nevertheless, there were too few observations with positive utilization of traditional medicine in the "cleaned" estimating sample to allow for statistical analysis. We could not obtain correct predictors of fees charged by healers, for instance; furthermore, traditional medicine could not be distinguished from other types of home care. Consequently, we incorporated traditional care in the "home care" alternative.

a negligible number (about 10) of the doctors and nurses in the rural sample made any home visits. Furthermore, healers did not charge for services provided to 67 of the 118 "patients" in the rural sample. The average fee was 218 CFAF (47 cents in 1985 prices). The average number of traditional health care consultations excluding outliers with more than 10 visits, was about 2.7, similar to the average number of consultations with either doctors or nurses, given positive utilization.

TABLE A.1: Number of Persons with Healer Consultations Age Group by Place of Consultation [a]

	Healer's Home	Person's Home
Ages 0-5	19 (23)	11 (13)
Ages 6-15	8 (11)	11 (14)
Ages 16-49	27 (20)	17 (12)
Ages 50+	17 (17)	8 (8)
Total	71 (71)	47 (47)

a/ Figures in parenthesis denote number of persons with healer consultations adjusted for the actual population shares.

TABLE A.2: Number of Persons with Healer Contacts Age Group by Sex

	Male	Female
Ages 0-5	15	15
Ages 6-15	12	7
Ages 16-49	21	23
Ages 50+	12	13

Appendix B

Econometric Specification

In the analysis of discrete choice a distinction is made among utility levels associated with each alternative. Furthermore, the random utility maximization (RUM) hypothesis is usually invoked. [1] In the binary case (easily extended to the case of multiple choices), RUM states that, [2]

$$U_1 = V_1 + \varepsilon_1$$
$$U_2 = V_2 + \varepsilon_2$$

U_1, U_2 are utility associated with each choice, V_1, V_2 are "representative" utility terms and $\varepsilon_1, \varepsilon_2$ are random, unobservable components of utility which vary across individuals. For convenience, subscripts denoting the individual were suppressed.

An individual will chosen the alternative that yields him the most utility. The probability that this individual chooses alternative 2 over alternative 1 is given by

$$P_1 = \mathrm{Prob}(U_2 > U_1)$$

substitution yields

1/ See McFadden 1981.

2/ For an extension of RUM to the trinomial case see Hausman and Wise (1978).

$$P_1 = \text{Prob}(V_2 - V_1 > \varepsilon_1 - \varepsilon_2)$$

This probability may be specified as a logit model,

$$P_i = \frac{e^{V_i}}{\sum_{j=1}^{J} e^{V_j}}$$

which in turn, is rewritten to reflect differences in representative utilities. The dichotomous market entry decision is written as a binary logit

$$P_2 = \frac{e^{\nu_2}}{1 + e^{\nu_2}}$$

where $\nu_2 = V_2 - V_1$

and the choice among several providers is modeled as a multinomial logit

$$P_i = \frac{e^{\nu_i}}{1 + \sum_{\substack{j=1 \\ j\neq k}}^{J} e^{\nu_i}}$$

where $\nu_j = V_j - V_k$

In the third part of our analysis we estimate separate demand equations for the number of doctor contacts and the number of nurse contacts a person had, conditional upon positive utilization of doctor or nurse services. Since our main concern is with price and income effects we opt for a simple linear specification adapted, with minor modifications, from Hausman (1981),

$$N_i = a^i P + bY + c\,[Z, H]$$

where N_i is demand for consultations with the i'th health care provider. Y is income, Z is a composite of demographic traits and H is an indicator of health needs, a^i is an alternative specific parameter, b is the income parameter and c is a vector of parameters. Following Action (1975) the theoretically correct price variable is the full price, which is the sum of the money price and the product of the opportunity cost of time (w) multiplied by the time devoted to consumption of medical care (t), that is $p + wt = P$. Health care in rural Côte d'Ivoire is provided free of charge. In the absence of wage data we will use travel time to the nearest provider as a proxy variable for the full price of obtaining medical care.

A general solution for an indirect utility function yielding the linear demand equation is 1/

1/ An easy way to verify that the above indirect utility function yields a linear demand function is to apply Roys identity

$$N = -\frac{\partial V/\partial P}{\partial V/\partial Y}$$

$$V_i = e^{-bP} \left(Y + \frac{1}{b} [a^i P + \frac{a^i}{b} + c (Z,H)]\right)$$

Since $V_1 > V_2$ only if $e^{-bP}\, V_1 > e^{-bP}\, V_2$ the decision maker effectively chooses an alternative on the basis of a comparison among

$$\tilde{V}_i = \frac{a^i}{b} + Y + a^i P + c (Z, H)$$

This function of representative utility is linear in prices, income and personal traits. Both the constant $\frac{a^i}{b}$ and the price effect vary across alternatives. Personal traits may be taken as indicators of the decision-maker's perceived quality of health care, or as "taste" variables that effect the utility derived from consuming services provided by the provider chosen. (For a more detailed discussion see Gertler et al. 1986). Note that in this formulation income is differenced out of the model. However, since income elasticities are of interest to us the income variable was reintroduced in the empirical model.

The advantage of this framework is that it allows us to consistently use the same simple specification for all stages of the analysis while closely conforming with utility maximization. It also enables us to calculate total market response elasticities presented in Section V.

Alternatively, we can estimate the market response using a selectivity bias approach developed in Lee (1983) and Trost and Lee (1984). In the first step the following selection term is generated from the multinomial logit model of provider choice:

$$\lambda = \phi(J(\beta_s' X))/F(\beta_s' X) \quad \underline{1}/$$

where β_s is the parameter vector of the chosen alternative, ϕ is the standard normal density function, and F is the cumulative normal distribution. Letting Φ denote the standard normal distribution function, we also have the transformation $J = \Phi^{-1}F$. Detailed proof is given in the above references. Note that there are unique selection terms for the doctor alternative and for the nurse alternative. In the second stage we estimate separate OLS regressions on doctor contacts and nurse contacts, where λ is included among the explanatory variables. A high asymptotic t-value on the parameter of λ indicates that sample selection is present. Thus the presence of λ in the demand regressions corrected for sample selection thereby yielding consistent parameter estimates.

Several factors will help us identify the demand equations. First the selection term is highly non-linear. Second, we include a taste parameter in the discrete choice model which affects the decision maker's choice of a health care provider but not the actual amount of health care obtained (Savanna). Finally, the functional form of the "healthiness" assessment variable in the discrete choice model differs for the healthiness measure in The quantity demand equation for reasons given in Section III.2.

Results obtained from OLS regressions and the two step procedure are compared in Section IV.

Appendix C

Derivation of Elasticities

Elasticity is defined as the percentage change in variable Y with respect to a percentage change in another variable X. (The individual's subscript is suppressed for convenience) generally:

$$E = \frac{\partial Y}{Y} \Big/ \frac{\partial x}{x} = \frac{\partial Y}{\partial x} \cdot \frac{x}{Y}$$

In the case of discrete choice variables the above formula is given in probabilistic terms, i.e. Y is replaced by the predicted probability of choosing any given alternative. The marginal effect, $\partial Y/\partial x$ is derived below. We may then ask, what is the change in the probability of choosing alternative j as x varies?

A simplified elasticity formula is available for binary logit.

$$E^{P_j}_{x_{jk}} = \beta_{jk}\, x_{ijk}\, (1-P_j)$$ 1/

This formula also applies to a special variant of the multinomial logit model, where at least some of the explanatory variables are alternative specific. With this specification, the probability of choosing a doctor, for instance, depends only on travel time to a doctor, not on travel time to a

1/ This may be calculated using the means of $\tilde{x}_i$ and the predicted probability (P_i) or as an average of all individual elasticities. We used the latter method.

nurse or healer. (This model is known as conditional logit, or McFadden's multinomial Logit.)

PROOF

For generality we derive the proof for McFadden's multinomial logit, with J alternatives and at least one alternative specific variable; x_j should be thought of as a vector of dependent variables in alternative j, with a corresponding coefficient vector β_j We are interested in the marginal effect of the k'th alternative specific variable.

$$P_j = \frac{e^{\beta_j' x_j}}{\sum_{j=o}^{J} e^{\beta_j' x_j}} \qquad 1/$$

Using the quotient rule:

$$\frac{\partial P_j}{\partial x_{jk}} = \frac{(\Sigma e^{\beta_j' x_j}) \dfrac{\partial e^{\beta_j' x_j}}{\partial x_{jk}} - e^{\beta_j' x_j} \dfrac{\partial \Sigma e^{\beta_j' x_j}}{\partial x_{jk}}}{(\Sigma e^{\beta_j' x_j})^2}$$

$$= \frac{(\Sigma e^{\beta_j' x_j}) (e^{\beta_j' x_j}) \beta_{jk} - (e^{\beta_j' x_j}) (e^{\beta_j' x_j}) \beta_{jk}}{(\Sigma e^{\beta_j' x_j})^2}$$

1/ Binary logit is a special case of MNL, where $P_j = \dfrac{e^{\beta' x_j}}{1 + e^{\beta' x_j}}$

Using the definition of P_j:

$$\frac{\partial P_j}{\partial x_{jk}} = P_j \beta_{jk} - P_j^2 \beta_{jk}$$

Hence

$$E_{jk}^{P_j} = P_j \beta_{jk} (1 - P_j). \frac{x_{jk}}{P_j}, \text{ Yielding}$$

$$E_{jk}^{P_j} = P_j \beta_{jk} x_{jk} (1-P_j) \quad \underline{1}/$$

In our case, however, each alternative faced the same vector of explanatory variables. (The probability of choosing say, a doctor depended on travel times to each type of practitioner). For convenience we will assume that there is only one dependent variable, x_k. Therefore, the marginal probability of selecting the j'th alternative with respect that variable is

$$\frac{\partial P_j}{\partial x_k} =$$

$$\frac{(\Sigma e^{\beta_j x_k})(e^{\beta_j x_k}) \beta_j - (e^{\beta_j x_k}) \bullet (e^{\beta_0 x_k} \beta_0 + e^{\beta_1 x_k} \beta_1 \ldots + e^{\beta_J x_k} \beta_J)}{(\Sigma e^{\beta_j x_k})^2}$$

$\underline{1}/$ In the presence of an interaction term, between say, variable x_k and variable x_{k+1}, the elasticity formula is simply

$$P_j x_{jk} (\beta_{jk} + \beta_{jk+1} x_{k+1}) (1 - P_j)$$

Before simplifying invoke the normalization $\beta_0 = 0$ (see Maddala, p. 42), now the expression above reduces to:

$$\frac{\partial P_j}{\partial x_k} = P_j \beta_j - P_j \sum_{j=1}^{J} P_j \beta_j$$

Elasticity now becomes

$$E_k^{P_j} = (\beta_j - \sum_{j=1}^{J} P_j \beta_j) x_k$$

Elasticities reported in Tables 4.4B and 4.7B are based on this formula.

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Health Care Financing and the Demand for Medical Care

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Health Care Financing and the Demand for Medical Care

The Living Standards Measurement Study

The Living Standards Measurement Study (LSMS) was established by the World Bank in 1980 to explore ways of improving the type and quality of household data collected by statistical offices in developing countries. Its goal is to foster increased use of household data as a basis for policy decisionmaking. Specifically, the LSMS is working to develop new methods to monitor progress in raising levels of living, to identify the consequences for households of past and proposed government policies, and to improve communications between survey statisticians, analysts, and policy makers.

The LSMS Working Paper series was started to disseminate intermediate products from the LSMS. Publications in the series include critical surveys covering different aspects of the LSMS data collection program and reports on improved methodologies for using Living Standards Survey (LSS) data. More recent publications recommend specific survey, questionnaire and data processing designs, and demonstrate the breadth of policy analysis that can be carried out using LSS data.

LSMS Working Paper
Number 37

Health Care Financing and the Demand for Medical Care

Paul Gertler
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The World Bank
Washington, D.C., U.S.A.

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ABSTRACT

This LSMS working paper includes two reports that are part of a larger study on "Health Care Demand and Resource Mobilization". 1/ This study addresses the issue of how various financing systems for medical care influence its utilization. Emphasis is on the impact of introducing (or raising) user fees, in terms of distributional effects, welfare consequences and revenue potential.

The first paper develops a discrete choice model that allows for the quantification of the effects of price and non-price variables on a person's decision of whether or not to obtain medical care, and if so, from which provider. The empirical work is based on recent data from a Peruvian health survey. The second paper estimates a variant of this model, using data from the 1985 Ivorian Living Standards Survey.

The major message of both papers is that in the absence of user fees (or at low fee levels) private costs (here represented by travel time to the nearest provider) take over the rationing role of the conventional price mechanism. The first paper shows how the quantification of this effect can be used to simulate the distributional and welfare consequences of changing the fee structure.

None of the results in these papers should be judged as final, if only because both papers focus on provider choice rather than on total medical consumption. However, the main empirical results appear to be robust, and the effect of non-price rationing is found to be much stronger than previously reported in the literature.

1/ Each report is self-contained which results in a certain amount of overlap in the exposition.

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I. Are User Fees Regressive?
The Welfare implications of Health Care Financing Proposals in Peru

I. INTRODUCTION

Many developing countries have created extensive publicly supported health care systems, access to which is at little or no cost. 1/ The financial crisis of the 1980s has forced many of them to consider instituting user fees (i.e. charge individuals for access). Those in favor of user fees argue that they facilitate recovery of the cost of providing the service, and, if they are set at marginal cost, improve allocative efficiency. 2/ The strongest argument against user fees is that they may be regressive in that they may not allow all income groups equal access to medical care because the poor may be more price sensitive than the rich. Even if everyone is equally price sensitive, user fees will be regressive if the welfare loss for the poor relative to income is larger than for the rich.

In the absence of user fees, equal access is still not assured. It has been well known since Acton (1975) that nonmonetary access costs such as travel time are important determinants of health care choices. The geographical distribution of services may make access more difficult for some groups. For example, locating facilities closer to the upper and middle classes discriminates against the poor. User fee proponents argue that revenues can be reinvested to reduce nonmonetary access costs, and consequently minimize consumers' welfare loss.

Since user fee proposals are so widespread and the potential welfare effects so large, it is important that some *ex ante* analysis be performed. This paper provides a methodology for such an *ex ante* analysis, and to our knowledge, the first estimates of expected revenues and welfare losses (measured as compensating variations) associated with one such proposal.

The analysis requires estimation of the demand for health care, from which the revenues and welfare changes of proposed user fees can be simulated. The magnitude of the revenue and welfare effects depend crucially on the price elasticity of demand. Previous studies in developing countries have found little if any impact of price on demand. These studies model the demand for health care as a discrete choice between alternative providers, with the price effect specified to be independent of income. [3/] This assumption is extremely restrictive, since one would expect the wealthy to be less sensitive to price differences across providers than the poor. Indeed, we show that this specification is inconsistent with stable utility maximization, and that, if health is a normal good, the demand for health care must become more price elastic as income falls.

The discrete choice specification in this paper is derived from a theoretical model that implies a natural interaction between price and income in the demand functions, and those demand functions are estimated using a parsimonious flexible functional form that allows the data to determine the effect of income on price elasticities. The resulting model facilitates the study of the distributional impacts of user fees.

The empirical investigation considers the potential effects of user fees in urban Peru. The estimates show that price plays an important role in health care demand. Further, demand becomes more elastic as income falls indicating, as expected, that health is indeed a normal good. This implies that the introduction of health care user fees in Peru would reduce access proportionally more for the poor than the rich, and, in this sense, be regressive. Our simulations demonstrate that while user fees would generate substantial revenues, they would also generate substantial reductions in aggregate consumer welfare with the burden of the loss on the poor. The simulations also indicate that the welfare loss from the current spatial distribution of public health care services is roughly equal to the expected welfare loss from moderate user fees, and that the loss is fairly evenly distributed across income groups. Therefore, if the government imposed moderate user fees and used the revenues to solve the rationing problem, there would be little if any aggregate welfare loss, but there would be a redistribution of welfare from poor to rich.

II. BEHAVIORAL ASSUMPTIONS

The framework for this discussion is a static model in which utility depends on health and consumption of goods other than medical care. When an illness or accident is experienced, individuals must decide whether to seek medical care. The benefit from consuming medical care is an improvement in health, and the cost of medical care is a reduction in the consumption of other goods. Individuals not only have to decide whether to seek care, but also what type of care. They are faced with a set of alternative providers, each of which has a different potential impact (efficacy) on their health. This efficacy depends on providers' skills, individuals' characteristics (e.g. medical problems, general health status, and ability to implement the recommended treatment plan), and a random term that captures the notion that the efficacy of medical care is not deterministic. An individual's expectation of this impact can be viewed as the perceived quality of care.

In essence, individuals are faced with a discrete choice decision. A choice must be made between the various provider alternatives, including self-care. Each alternative offers a set package (quality) for a given price, where the price includes both monetary outlays and nonmonetary access costs such as travel and waiting time. Based on this information, their health statuses, types of medical problems, and incomes, individuals choose the alternatives that yield the greatest utilities.

We consider the short run utility maximization problem faced by an individual who has recently experienced an accident or illness. Let the utility, conditional on receiving care from provider j, be given by

$$U_j = U(H_j, C_j, T_j) \quad , (1)$$

where H_j is expected health status after receiving treatment from provider j, C_j is expenditures on consumption after paying provider j, and T_j is the nonmonetary cost of access to provider j.

The health care purchased from provider j is invested in health. The perceived quality (marginal product) of provider j's medical care is the expected improvement in health. Let H_0 be expected health status without professional medical care (i.e. self-treatment); then, the perceived quality of provider j's care is $Q_j = H_j/H_0$, which yields an expected health care production function of the form

$$H_j = Q_j H_0 \ , (2)$$

where H_j is proportional to H_0. The quality parameter depends upon provider characteristics (e.g. training and facilities) and individual characteristics (e.g. type and severity of illness).

This production function takes on a rather simple form for the self-care alternative. Since H_j equals H_0, the proportionality factor is unity for the self-care alternative. In effect, this normalizes the health care production function so that the quality of a particular provider's care is measured relative to efficacy of self-care.

The level of consumption expenditure conditional on choosing provider j, C_j, is derived from the budget constraint. Let P_j be provider j's price and Y be income, then

$$C_j = Y - P_j \ , \quad (3)$$

with $C_j \geq 0$required for feasibility. 4/ Substitution of (3) into (1) yields

$$U_j = U(H_j, Y - P_j, T_j) \ .$$

Income affects utility through the consumption term, and is assumed to be exogenous. 5/

Now we are ready to specify the utility maximization problem. Suppose the individual has J+1 feasible alternatives (with the j=0 alternative being self-care). The unconditional utility maximization problem is

$$U^* = \max(U_0, U_1, \ldots, U_J) \ , \quad (4)$$

where U* is the highest utility the individual can attain.

If health is a normal good, then the demand for health increases with income. A necessary condition for normality is that as income rises, the marginal rate of substitution of consumption for health diminishes, holding health constant. This point is demonstrated in figure 1, where the continuous choice case with health being a normal good is pictured. As income rises the point of utility maximization moves out from the origin along the expansion path. Holding health constant at A, we move to the right along the horizontal line as income rises, intersecting the indifference curves at points of flatter slopes, implying a diminishing marginal rate of substitution.

In a discrete choice world, normality implies that as income rises individuals are more likely to choose the "higher price/higher quality" options. Here as well, a necessary condition for normality is that as income rises, the marginal rate of substitution of consumption for health diminishes, holding health constant. This is demonstrated in figure 2, where the discrete choice case with health as a normal good is pictured. In figure 2, there is a choice between a "high price/high quality" option (P_h, Q_h), and a "low price/low quality" option (P_ℓ, Q_ℓ). At a low income level, say Y_ℓ, the choice is between points A and B; i.e. between a gain in health of (H_h - H_ℓ) and a gain in consumption of (P_h - P_λ). At income Y_ℓ, the additional consumption is preferred to the additional health and the "low price/low quality" option B is chosen. The high income individual with income Y_h has a choice between points C and D. These points represent the same tradeoff between health and consumption as points A and B. As income rises the marginal rate of substitution of consumption for health falls along both horizontal lines H_h and H_ℓ. Eventually, at some income between Y_ℓ and Y_h, the gain in health is preferred to the gain in consumption. At income Y_h, the "high price/high quality" option C is chosen.

In a discrete choice world, if health is a normal good, a rise in income increases the likelihood that individuals purchase "higher price/higher quality" alternatives. Another way of looking at this is that an increase in price is less likely to dissuade richer individuals from choosing the "higher price/higher quality" alternatives. In a probabilistic sense, normality implies that richer individuals are less price elastic than poorer individuals.

III. EMPIRICAL SPECIFICATION

The solution to (4) yields a system of demand functions, whose forms are probabilities that the alternatives are chosen given that an individual experiences an accident or illness. The demand function for a given alternative is found by calculating the probability that this particular alternative yields the highest utility amongst all the alternatives. The functional form of the demand functions depends on the functional form of the utility function conditional upon choosing a particular provider and the distribution of the stochastic variables.

A. The Conditional Utility Function

It is customary to begin by considering a linear functional form for the conditional utility function in (1). Substitution of (3) into a linear utility function yields

$$U_j = \alpha_1 H_j + \alpha_2 (Y - P_j) + \alpha_3 T_j + \varepsilon_j \quad (5)$$

where ε_j is a random taste shock that is uncorrelated across alternatives. Notice that α_2Y enters each alternative's utility function, implying that the influence of income on utility does not vary by alternative. Since only differences in utility matter, a linear utility function imposes the restriction that income has no effect on the choice of provider and that the marginal rate of substitution is constant. Therefore, this specification is inconsistent with health being a normal good.

A common method of trying to relax this restriction is to allow the coefficient on consumption to vary by alternative. [6/] That specification violates the maximization of a stable utility function. It asserts that, holding income, prices, and health constant, the marginal rate of substitution varies by alternative.

A parsimonious parameterization that does not place second order restrictions on the marginal rate of substitution, does not violate the maximization of a stable utility function, and is linear in parameters, is the semi-translog, where health and access costs enter in log form and consumption enters in both log and log squared form. [7/] Substitution of (2) and (3) into a semi-translog conditional utility function yields

$$U_j = \ln H_0 + \ln Q_j + \alpha_1 \ln(Y - P_j) + \alpha_2 \ln(Y - P_j)\ln(Y - P_j) + \alpha_3 \ln T_j + \varepsilon_j \quad (6)$$

The quadratic term is necessary so that the specification does not impose normality and a diminishing marginal rate of substitution, but rather allows us to test for them.

B. Quality

In equation (6) neither $\ln H_0$ nor $\ln Q_j$ are observed. Since $\ln H_0$ appears in the utility function for all the choices and its value does not vary by alternative, it does not influence which alternative is preferred, and therefore can be ignored.

A more difficult issue arises because of the unobservability of $\ln Q_j$. To solve this problem we specify a quality (marginal product) function for each provider type. Specifically, let the expected quality from provider j be

$$\ln Q_j = \beta_{0j} + \beta_{1j}X + \beta_{2j}Z_j + \tau_j \text{ , (7)}$$

where X is a vector of the individual's characteristics (i.e. measures of health status, severity of illness and education), Z_j is a vector of characteristics of provider j, and τ_j is a random shock. The error term τ_j represents unobserved individual characteristics, such as severity and complexity of illness, that may affect the providers' marginal productivities relative to self-care. Recall that quality is normalized relative to the self-care alternative, implying that $\ln Q_0 = 0$. The error term τ_j may be correlated across the non-self-care alternatives.

The reduced form conditional utility function for alternative j is found by substituting (7) into (6). Specifically, for alternatives j=1,...,J,

$$U_j = V_j + \varepsilon_j + \tau_j \text{ , (8)}$$

where

$$V_j = \beta_{0j} + \beta_{1j}X + \beta_{2j}Z_j + \alpha_1 \ln(Y - P_j) + \alpha_2 \ln(Y - P_j)\ln(Y - P_j) + \alpha_3 \ln T_j .$$

Note that the intercept and coefficients on the quality terms vary by alternative as do the values of consumption and access costs (but not their coefficients). Since $\ln Q_0 = 0$, $T_0 = 0$, and $P_0 = 0$, the reduced form conditional utility function for the self-care alternative becomes

$$U_0 = \alpha_1 \ln Y + \alpha_2 \ln Y \ln Y + \varepsilon_0 .$$

Note further that τ_0 does not exist as quality is normalized relative to the self-care alternative.

C. The Budget Constraint

Specification of the budget constraint requires determining the relevant budgeting period. Since the health care decision is discrete and made irregularly, consumers may be willing to borrow against future income. If capital markets are perfect and individuals (or families) can borrow without restriction, the relevant income constraint is the present value of income, or wealth. The other extreme assumption is that no resources outside each income period can be used. The actual period may be somewhere in between.

We let the data determine the appropriate budgeting period. Define y as permanent monthly income and r as the period discount rate, then the constraining income in (4) is ky, where the parameter k is a function of the length of the budgeting period and r. If budgeting is restricted to one period, then k is equal to 1. If the budgeting period is infinity (i.e. there is perfect borrowing and lending), then k is equal to 1/r.

The addition of k implies (8) is no longer linear in parameters. We linearize (8) using an approximation to the log of consumption. The log of consumption can be expressed as

$$\ln(ky - P_j) = \ln(1 - P_j/ky). \quad (9)$$

Since P_j/ky, the budget share of alternative j, is expected to be small, the second term in (9) can be approximated by $-P_j/ky$, which allows us to rewrite the log consumption and log consumption squared terms in (8) as

$$\alpha_1 \ln(ky) + \alpha_2 \ln(ky)\ln(ky) - \left[(\alpha_1 + 2\alpha_2 \ln k)/k\right](P_j/y) + (\alpha_2/k^2)(P_j/y)^2 - (2\alpha_2/k)(P_j/y)\ln y. \quad (10)$$

Notice that the first two terms in (10) are the same across all alternatives, including self-care. Since only differences in utility across alternatives matter, these terms have no effect on provider choice, and therefore, can be left out. Further, when k equals one, (10) reduces to

$$-\alpha_1(P_j/y) + \alpha_2(P_j/y)\left[P_j/y - 2\ln y\right]. \quad (11)$$

Since both (10) and (11) are linear in parameters, they provide us with an easy likelihood ratio test for k equal to one.

D. The Demand Functions and Welfare

The demand function for an alternative is the probability that its utility is greater than from any other alternatives. McFadden (1981) shows that, given reasonable distributional assumptions on ε_j and τ_j, these demands take on a nested multinomial logit (NMNL) form, where it is first decided whether to seek care, and then conditional on seeking care deciding from which provider to seek care. The probability that provider j is chosen is

$$\Pi_j = \frac{\exp[\sigma \ln(\sum_{j=1}^{J} \exp(V_j))]}{\exp(V_0) + \exp[\sigma \ln(\sum_{j=1}^{J} \exp(V_j))]} \; \frac{\exp(V_j)}{(\sum_{j=1}^{J} \exp(V_j))} \; .$$

and the probability of self-care is

$$\Pi_j = \frac{\exp(V_0)}{\exp(V_0) + \exp[\sigma \ln(\sum_{j=1}^{J} \exp\ (V_j))]}$$

where the V_j's are given by (8) with (10) substituted for the log consumption terms. Also the $\alpha_1 \ln(ky)$ and $\alpha \ln(ky) \ln(ky)$ are excluded as they do not vary by alternative, which implies that $V_0 = 0$. The parameter σ is one minus the correlation of the j=1,...,J utilities introduced by the τ_j's.

McFadden also shows that NMNL reduces to a multinomial logit (MNL) when σ is unity. The NMNL is more general than MNL in that it allows correlation between the utilities that share common attributes, and therefore does not suffer from the independence of irrelevant alternatives assumption.

The estimated demand functions can be used to project the impact of user fees on demand (and revenues), and the number of people who do not seek health care as a result of user fees. These demand functions also form the basis of our computation of the welfare costs of user fees, where the welfare costs are measured by compensating variations. 8/ For example, consider changing the vector of provider prices from P^1 to P^2. Following Small and Rosen (1981), in the case of a nested multinomial logit, the amount of income the individual must be given to make him as well off at P^2 as at P^1 is

$$\Delta e = (1/\lambda)\{\ln[\exp(V_0^1) + (\textstyle\sum_{j=1}^{J} \exp(V_j^1))^{\sigma}] - \ln[\exp(V_0^2) + (\textstyle\sum_{j=1}^{J} \exp(V_j^2))^{\sigma}]\} \quad (12)$$

where V_j^1 and V_j^2 are evaluated at P^1 and P^2, respectively, and λ is the marginal utility of income. 9/ The compensating variation for nonprice changes (such as travel time) can be similarly calculated.

IV. DATA AND INSTITUTIONAL ENVIRONMENT

The empirical work utilizes data from a 1984 Peruvian household survey, the Encuesta Nacional de Nutricion y Salud (ENNSA). The survey contains a rich set of socio-economic data, as well as morbidity and health care utilization information for a two-week recall. Since this study analyzes contingent health care demand, we restricted our sample to those persons who reported having symptoms or an accident. The sample was taken from individuals living in the urban Sierra and Lima regions. Rural regions were excluded because reliable income data do not exist for them. A sample of 3412 individuals age 16 and above is the basis for this work. Descriptive statistics are presented in table 1.

Peru has a mix of public and private health care. The major provider of public health care is the Ministry of Health, which operates hospitals and clinics. The next largest provider of public health care is the Instituto Peruano de Seguridad Social (Social Security). It operates hospitals for its members, which are not available to non-members. In the analysis, Social Security hospitals are not viewed as a separate alternative, but rather are included in the public hospital alternative. A dummy variable indicating whether the individual was a Social Security member is included in the hospital equation to account for quality differences. The dominant private health care providers are physicians. Other types of private providers, such as traditional healters, and pharmacists were not numerically important, and were merged with the no consultation group to form our "self-care" alternative. The four alternatives are: (1) self-care; (2) public hospital; (3) public clinic; and (4) private doctor.

The arguments of the quality (marginal product) function are the initial state of health, the type of illness, human capital, and provider characteristics. Measures of health status prior to treatment are age and type of illness, which is measured by a set of dummy variables indicating whether the individual's medical problem was an accident or acute illness, digestive illness, respiratory illness, or other illness. The other illness dummy variable was excluded. The quality of providers is thought to vary by location. Hence, a set of regional dummy variables indicating if the individual lives in central Lima, the north and south cones of Lima, and the north, south, and central regions of the Sierra are included. The central Sierra dummy variable was excluded. In addition, the individual's education was included as a measure of human capital.

Income was measured as total family income in the month prior to the survey. Family income is the relevant concept here because family members are not provided or denied health care on the basis of their labor force statuses. This measure reduces the sensitivity of income to the illness of any particular family member.

Since income does not vary by alternative, we need variation in prices across alternatives to identify and estimate the coefficients on the log consumption and log consumption squared terms. In a discrete choice framework, identification requires variation across alternatives. Although variation across individuals is not necessary, it is desirable as it improves the estimation precision. In our data the public hospital and clinic prices do not vary by individual, but there is substantial cross-individual variation in private doctor prices as the data covers many different regions, were collected over a nine month period in which relative prices changed substantially.

Measuring prices posed a difficult problem. The model requires prices for each alternative, but these were not directly available. The ENNSA only collected price information for the provider from which the individual received care. For those who sought care, price data were only available for the alternative they chose, and for individuals who did not seek care there is no information.

The measurement problem was easily solved for hospitals and clinics, since they charged a user fee of 1,000 to 2,000 soles. In our sample, about 35 percent of hospital and clinic users reported paying nothing, about 50 percent reported paying 1,000 soles, and almost all the rest reported 2,000 soles. About half of the reported zero fees are from Social Security hospitals, which do not charge their members for services. The other half are probably a result of failure to collect the fees. Since these prices are minuscule relative to monthly family income (see table 1), we assumed individuals expected to pay 1,000 soles at Ministry of Health hospitals and clinics.

For private doctor prices, we used the available information to estimate hedonic price equations, and then imputed prices for all individuals. The equation specified price to be a function of age, illness, and market structure variables such as population and availability of health care services. Income was not used in order to avoid attributing higher prices to higher income individuals who may have purchased higher quality care. An additional problem was selectivity bias. The observed distribution of prices paid will not be representative of the ex ante distribution of prices because individuals are more likely to choose low price alternatives. We corrected for this selectivity bias by following an instrumental variables procedure used in Dubin and McFadden (1984). 10/

Finally, we measure nonmonetary access cost by travel time to the provider. The travel time data suffer from the same problems as the price data. In addition, travel time information was collected in discrete categories. Binary logit hedonic travel time equations (with selectivity bias correction) were used to estimate the probability of traveling more than an hour.

V. RESULTS

The parameters of a MNL and a NMNL were estimated by maximum likelihood. The NMNL nested the choice of provider within the choice of whether to seek care at all. The hypothesis that the NMNL is not different from the MNL was accepted at the .05 level, and the hypothesis that k equals unity was also accepted at the .05 level. 11/ The estimated coefficients and associated t-statistics for the MNL with k equal to one are presented in table 2.

The coefficients on log consumption and log consumption squared are significant at the .1 and .01 levels, respectively. Price and income therefore play important roles in the demand for medical care. Since price and income enter in a highly nonlinear form it is difficult to assess their influence on demand just from looking at the coefficient values. For this reason, arc price elasticities for clinic, hospital and private doctor services were computed by sample income quintile and are presented in table 3. The price elasticities are negative over all prices and income groups, and demand is more elastic at lower incomes and at higher prices. The magnitude of the prices elasticities varies greatly by income. In the highest income quintile, demand appears to be completely inelastic, while demand in the lowest income quintile is much more sensitive to price.

We have assumed that income is exogenous. If, in fact, income is endogenous, there is a possibility of simultaneity bias. The bias is likely to have a downward impact on the estimated price and income effects, making them closer to zero. The effect we are interested in measuring is the causal impact of changes in income on health care demand. If health is a normal good, then that effect is positive. The simultaneity bias arises because an accident or illness may reduce income. The more severe and complex the illness or accident the greater the reduction in income. However, the more severely ill have greater medical need and are therefore more likely to seek medical care. This implies that the observed relation between income and demand will likely be biased towards zero. Since price enters our model as a reduction in consumption (Y - P), its effect is also likely to be biased towards zero. Therefore, our estimated price elasticities should be lower bounds on the true elasticities.

The coefficient on the probability of traveling more than an hour is negative and estimated with precision. This implies that increases in nonmonetary access costs reduce demand.

The estimated quality parameters are consistent with our expectations. The coefficients on age are positive and significant in the hospital and private doctor equations, and negative in the clinic equation. Hence, older individuals perceive private doctor and hospital care to be of higher quality than self-care and clinic care, and self-care to be of higher quality than clinic care. The coefficients on education are positive and significant in the private doctor and hospital equations, and negative and significant in the clinic equation. The coefficient estimates imply that education increases the expected productivity of private doctor care and hospital care relative to self-care, and reduces the expected productivity of clinic care relative to self-care.

The coefficients on the acute illness (emergencies) imply that hospitals and clinics have a comparative advantage in treating these problems over private doctor or self-care. Individuals with respiratory illnesses believe that they have a comparative advantage in treating themselves. Finally, Social Security hospitals are perceived to provide higher quality than Ministry of Health hospitals, and there is perceived quality variation by region.

VI. USER FEE SIMULATIONS

In this section we use the estimated demand functions to simulate the effects of user fees. A uniform fee is imposed at public facilities (hospitals and clinics). We consider two levels of fees, 10 and 20 thousand soles. These are realistic fee levels; the average fee for a visit to a private doctor was about 20 thousand soles. Monthly demands, revenues, and compensating variations are calculated by summing the individual estimates over the sample and then extrapolating to obtain population projections. Revenues are calculated in April 1984 soles. The base for the extrapolation is the product of the regional population and the overall regional probability of having an illness. Two private markets scenarios are considered: (1) where private doctors do not adjust their prices in response to the changes in public user fees, and (2) where private doctors adjust their prices by the same amount. Further, these scenarios are analyzed under the assumption (1) that the resulting revenues are not reinvested in the health care system, and (2) that the revenues are used to reduce nonmonetary access costs.

A. User Fees Without Reinvestment

Columns 3, 4, and 5 of table 4 report the results of the aggregate user fee simulations under both scenarios. They report the cumulative percentage change in total demand, the increase in public (hospital plus clinic) revenues and the welfare loss due to the user fee increase. [12] The results show that the imposition of moderate user fees can generate substantial public revenues with small reductions in the total demand for health care, but, of course, with even larger losses in consumers' welfare. Under scenario (1), for example, a user fee of 10 thousand soles generates approximately an additional 6,386 million soles per month in public revenues accompanied by a 7.5 percent reduction in demand and a fall of 7,123 million soles in consumers' welfare. Under scenario (2), that fee generates approximately 6,516 million soles with a 12.5 percent reduction in demand and a fall of 12,460 million soles in consumers' welfare.

Even though the aggregate change in total demand appears to be modest, the effects on the lower income groups are quite large and substantially higher than in the upper income ranges. This is demonstrated in table 5 which shows the percentage change in total demand accounted for by each income quintile, and the welfare loss as a fraction of income for each income quintile. On average, the lowest income quintile accounts for about 40 percent of the total decrease in the quantity of health care demand, while the highest income quintile accounts for only about 5 percent. Not only is the reduction in total demand concentrated in the lowest income groups, but the greatest welfare loss (relative to income) is also borne by them. The simulations show that the lowest income quintile suffers a reduction of welfare of between 3 and 11 percent of income, whereas the highest income groups loses less than one half of one percent.

B. User Fees With Reinvestment

In this set of experiments we assume the government uses the revenues to reduce nonmonetary access costs. In our model nonmonetary access costs are measured by travel time. This simulation assumes that the revenues are used to reduce everyone's travel time to a public clinic and hospital to within one hour or less (i.e. to reduce the probability of traveling more than one hour to a public facility to zero). This is a fairly egalitarian change because our data show that the median travel time probabilities are similar across all income groups.

Columns 6, 7, and 8 of table 4 report the aggregate results for the user fee experiment with reinvestment. Under both scenarios, a user fee of 10 thousand soles and a reduction of travel time to less than an hour increases total consumers' welfare, but a user fee of 20 thousand soles reduces consumers' welfare. Therefore, at a user fee somewhere between 10 and 20 thousand soles, consumers in the aggregate are indifferent between the current (1984) user fees and the higher user fees with easier access. The missing component of this comparison is whether the revenues generated by this user fee would be sufficient to cover the costs of building and operating the additional facilities necessary to reduce travel time.

Even if revenues were sufficient, such a policy would redistribute welfare from poorer to richer. This is demonstrated in table 6 which presents the percent change in total demand within each income quintile, and consumers' welfare loss as a fraction of income. An increase in user fees with reinvestment would result in a substantial decrease in demand by the poor and a slight increase in demand by the rich. In addition there would be a relatively large welfare reduction for the poor and a slight rise in welfare for the rich.

VII. SUMMARY AND CONCLUSIONS

We have derived a discrete choice model of the demand for medical care from a theoretical model that implies a natural interrelation between price and income. We show that, in the context of a discrete choice model, if health is a normal good, then the price elasticity of the demand for health care must decline as income rises. This implies that the models in previous discrete choice studies that restrict the price effect to be independent of income are misspecified.

We estimated this model using data from a 1984 Peruvian survey, and a parsimonious flexible function form. Unlike previous studies, we find that price plays a significant role in the demand for health care, and that demand becomes more elastic as income falls, implying that user fees would reduce the access to care for the poor proportionally more than for the rich. Our simulations show that user fees can generate substantial revenues, but are accompanied by substantial reductions in aggregate consumer welfare, with the burden of the loss on the poor. These results demonstrate that user fees would be regressive both in terms of access and welfare.

The simulations indicate that the welfare loss for some people having to travel more than an hour to a public health care facility is roughly equal to the expected welfare loss from moderate user fees, and the first loss is fairly evenly distributed across income groups. Hence, if the government imposed moderate user fees and used the revenues to solve this access problem, there would be little if any aggregate welfare loss, but there would be a redistribution of welfare from poor to rich. This result is what one would expect in an urban environment where services are fairly evenly distributed, and may not be applicable to rural areas.

We have found that the introduction of user fees in Peru has the potential for raising significant revenues for cost recovery by shifting the financial burden (and commensurate welfare loss) of the health care system from taxpayers to users. We also show that user fees are regressive both in terms of access and welfare. In essence, the health care financing dilemma for developing nations is that the improvement in allocative efficiency and cost recovery from user fees are accompanied by a redistribution of welfare from poorer to richer. A natural solution to this dilemma is to introduce user fee schedules that increase with ability to pay. This type of price discrimination may generate substantial revenues with minimum welfare loss, if administrative costs are contained.

FOOTNOTES

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1/ See de Ferranti (1985) for a discussion of health care pricing methods in developing countries.

2/ Recently, the pros and cons of such proposals have been discussed in de Ferranti (1985), and Jimenez (1986).

3/ Studies of the demand for health care in developing countries include Akin et. al. (1985 and 1986), Birdsall and Chuhan (1986), Heller (1983), and Mwabu (1987).

4/ The feasibility condition requires income to be at least as large as the price of the alternative. The constraining level of income depends on the length of time over which individuals are able to budget. For example, if capital markets are perfect, the budget period is the individual's lifetime and the constraining income the present value of lifetime income. On the other hand, if there are cash constraints, the budgeting period could be as short as the interval in which the individual is paid. In section III.C, we propose a procedure which parameterizes the length of the budgeting period and allows it to be estimated.

5/ If, in fact, income is endogenous, there is a possibility of simultaneity bias. The simultaneity bias arises because an accident or illness may reduce income. We argue in section V that the bias is likely to have a downward impact on the estimated price and income effects, making them closer to zero. Hence, our estimated price elasticities should be lower bounds on the true elasticities.

6/ For example see Akin et. al. (1985 and 1986), Mwabu (1986), and Birdsall and Chuhan (1986).

7/ An obvious extension to the semi-translog is to include interactions and squared terms for health and nonmonetary cost terms. The problem with this is that the health terms, as will be discussed in a moment, will be a function of variables whose coefficients necessarily vary by alternative. Hence, this extension would require a substantially larger parameter space. Since the major objective of this study is to analyze price elasticities, we require the most flexibility in the parameterization of the consumption term. In addition, this specification would violate the necessary conditions for the model to be consistent with utility maximization specified in McFadden (1981). This point is taken up further in footnote 9.

8/ See Deaton and Muellbauer (1980) for discussion of compensating variation and other welfare measures.

9/ In order for (12) to be exact, the marginal utility of income, λ, must be independent of alternative specific characteristics and price. See McFadden (1981) and Small and Rosen (1981) for more discussion on this point. Although λ is independent of quality, it is not independent of price. Specifically

$$\lambda = \left(\alpha_1 + \alpha_2 \ln(Y - P)\right)/(Y - P) \ ,$$

and

$$\partial\lambda/\partial P = \left(2\alpha_2(\ln(Y - P) - 1) - \alpha_1\right)/(Y - P)^2 \ .$$

In most cases this term is likely to be small relative to λ, as the denominator is approximately income squared. Hence, λ is likely to be approximately constant across small differences in price. If indeed $\partial\lambda/\partial P$ is small, then each individual's average marginal utility of income over his/her alternatives is a good approximation of λ. Since this approximation is calculated for each individual, λ will vary greatly across individuals as there is substantial variation in income.

10/ A full description of the hedonic price and travel time methodologies and resulting estimates is provided in the Appendix.

11/ The estimated σ was 1.02 with a standard error of 0.86. The test statistic for the hypothesis that σ equals unity is 0.03 and is distributed student t. The critical value at the 0.05 level is 1.96. The test statistic for the null hypothesis that k=1 is 1.06 and is distributed $X^2(1)$. The corresponding critical value at the 0.05 level is 3.84. Our linearization of the log consumption term biases the estimate of k towards zero. However, the observed bias is minuscule when evaluated at the mean of the data.

12/ As discussed in footnote 9, the marginal utility of income, λ, is not constant across alternatives. Each individual's average over the three alternatives is a good approximation if the variation in λ across alternatives is small. In our simulations, the largest price difference across alternatives is 19 thousand soles. At the mean income level with a price of 1 thousand soles λ is 0.0111, and at a price of 20 thousand soles λ is 0.0115; a difference of 0.0004. This difference declines with income, implying that the goodness of the approximation increases with income. The approximation is poor only at very low levels of income.

APPENDIX

The hedonic private doctor price equation specifies the price of a single visit to be a function of the type of illness, age of the individual, and characteristics of the market. The market variables include the number of doctors, the number of hospital beds, the number of clinics, and the population of the district in which the individual lives. We correct for sample selection bias using a methodology derived in Dubin and McFadden (1982). This requires the estimation of a reduced form multinomial logit model of provider choice, from which a set of Dubin-McFadden selection correction terms are constructed (predicted) for each individual. The predicted correction terms are included as regressors in the hedonic price regression. Separate models are estimated for Lima and the Sierra. The market variables are not included in the Lima regression as there is no variation. The estimated coefficients and t-statistics are presented in table A.

The hedonic travel time equations for private doctors, hospitals, and clinics specify the time it takes to travel to a provider to be a function of the market variables, the location of the individual, a dummy variable indicating whether the main road in the district is paved, and the Dubin-McFadden selection correction terms. An additional problem arises because we only observe if the individual traveled more or less than an hour. The hedonic travel time equations were estimated as binary logits. Separate Lima and Sierra models were estimated for private doctors and hospitals, and, due to small sample sizes, a single pooled model was estimated for clinics. The estimated coefficients and t-statistics are also presented in table A.

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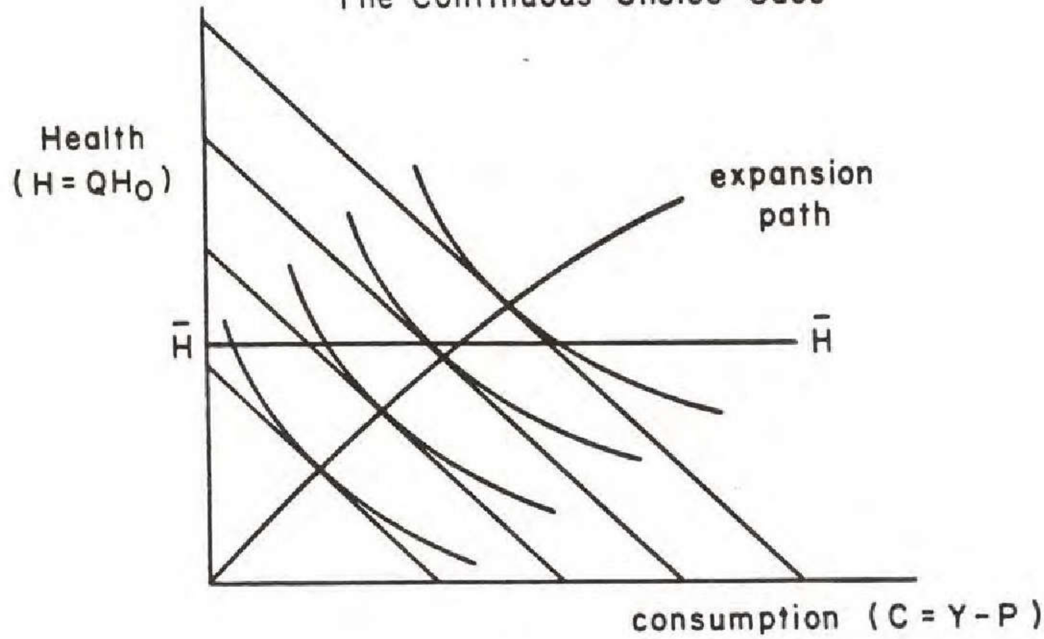
The Continuous Choice Case



The Discrete Choice Case

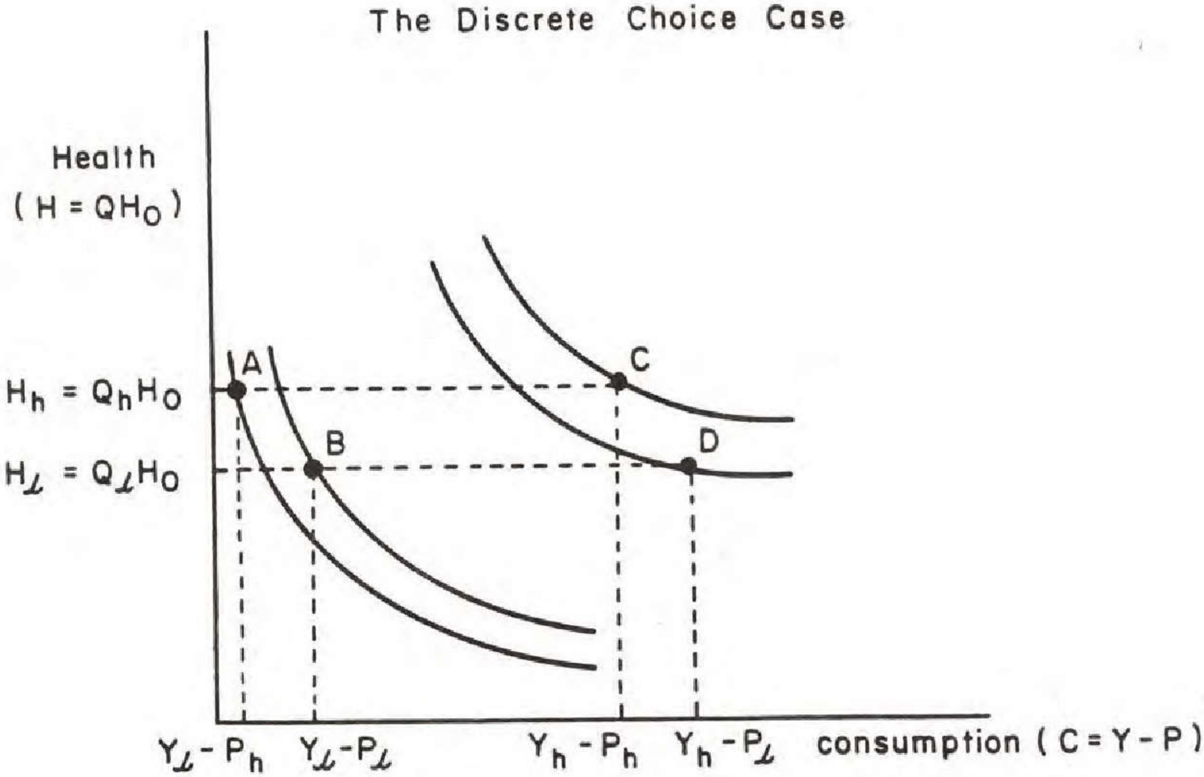


Table 1
Summary Statistics (N=3412)

Variable	Mean	Standard Deviation
Went to a public clinic (past 14 days)*	0.05	(0.22)
Went to a public hospital (past 14 days)*	0.11	(0.32)
Went to a private doctor (past 14 days)*	0.09	(0.29)
Age	39.18	(17.57)
Years of Education	7.73	(4.82)
Social Security*	0.15	(0.36)
Acute illness (past 14 days)*	0.05	(0.22)
Respiratory illness (past 14 days)*	0.15	(0.35)
Digestive illness (past 14 days)*	0.45	(0.50)
Resident of Lima*	0.37	(0.48)
Resident of South Cone*	0.10	(0.30)
Resident of North Cone*	0.22	(0.41)
Resident of South Sierra*	0.08	(0.27)
Resident of North Sierra*	0.15	(0.36)
Price of visit to private doctor**	19.01	(7.54)
Monthly income**	426.45	(1070.39)
Prob. travel time to clinic > 1 hour	0.01	(0.03)
Prob. travel time to hospital > 1 hour	0.13	(0.26)
Prob. travel time to private doctor > 1 hour	0.07	(0.14)

* Dummy variables (= 1 if answer is yes, = 0 otherwise).
** In 1,000's of April, 1984 soles.

Table 2
Multinomial Logit Estimated Coefficients and t-Statistics

Variable	Hospital	Clinic	Private Doctor
Log Consumption*	-2.77 (1.81)	-2.77 (1.81)	-2.77 (1.81)
Log Consumption Squared*	0.62 (2.40)	0.62 (2.40)	0.62 (2.40)
Travel Time*	-2.05 (3.44)	-2.05 (3.44)	-2.05 (3.44)
Age	0.01 (4.35)	-0.01 (1.67)	0.01 (2.53)
Education	0.04 (2.77)	-0.05 (2.10)	0.05 (3.91)
Acute Illness	0.78 (3.87)	0.83 (2.77)	-0.29 (0.90)
Respiratory Illness	-0.64 (5.19)	-0.37 (1.49)	-0.74 (5.42)
Digestive Illness	0.09 (0.59)	0.32 (1.49)	-0.17 (0.95)
Lima	0.22 (1.11)	1.21 (2.71)	-0.10 (0.46)
South Cone	0.53 (1.62)	1.69 (3.58)	0.02 (0.08)
North Cone	0.36 (1.50)	1.31 (2.91)	-0.45 (1.94)
South Sierra	0.63 (2.33)	0.78 (1.51)	-0.05 (0.18)
North Sierra	-0.07 (0.26)	1.19 (2.52)	-0.00 (0.01)
Social Security	0.77 (5.55)	-	-
Constant	-2.72 (8.70)	-3.12 (5.71)	-1.99 (6.32)

* The coefficients are restricted to be equal across equations.

Table 3
Arc Price Elasticities by Income Quintile

User Fee Change*		Quintile 1 (lowest)	Quintile 2	Quintile 3	Quintile 4	Quintile 5 (highest)
Clinic	0-10	-0.17	-0.12	-0.09	-0.06	-0.03
	10-20	-0.62	-0.42	-0.23	-0.15	-0.09
	20-30	-1.43	-0.58	-0.38	-0.26	-0.14
Hospital	0-10	-0.15	-0.12	-0.08	-0.05	-0.03
	10-20	-0.57	-0.34	-0.23	-0.15	-0.09
	20-30	-1.52	-0.56	-0.39	-0.26	-0.13
Private Doctor	0-10	-0.17	-0.12	-0.07	-0.06	-0.03
	10-20	-0.53	-0.35	-0.21	-0.14	-0.08
	20-30	-1.36	-0.60	-0.35	-0.25	-0.12

* Reported in thousands of April, 1984 soles.

Table 4
User Fee Simulations - Aggregate Results

Scenario	No Revenue Reinvestment				With Revenue Reinvestment		
	User* Fee Change	Cum % Δ in Total Demand	Public** Revenue Increase	Welfare** Losses	Cum % Δ in Total Demand	Public** Revenue Increase	Welfare** Losses
No Private Doctor	1-10	-7.5	6,386	7,123	+0.5	7,006	-7,354
Price Response	1-20	-14.3	11,306	13,872	-7.3	13,686	569
Equal Pri. Doctor	1-10	-12.5	6,516	12,460	-4.4	7,756	-2,160
Price Response	1-20	-23.9	11,906	23,957	-16.6	14,126	10,407

* Reported in thousands of April, 1984 soles.
** Reported in millions of April, 1984 soles.

Table 5
User Fee Simulations - Distributional Results (No Revenue Reinvestment)
Percentage Change in Total Demand Accounted for by Each Income Quintile and
Consumers' Welfare Loss as a Percentage of Income by Income Quintile

Scenario	User* Fee Change	Quintile 1 (lowest)		Quintile 2		Quintile 3		Quintile 4		Quintile 5 (highest)	
		A*	B**	A	B	A	B	A	B	A	B
No. Pri. Doctor	1-10	38.4	3.0	29.3	1.2	16.2	0.6	11.1	0.4	5.0	0.1
Price Response	1-20	37.6	6.2	26.5	2.3	17.5	1.2	12.1	0.7	6.3	0.2
Equal Pri. Doctor	1-10	39.2	6.1	25.3	1.9	16.9	1.0	12.0	0.6	6.6	0.2
Price Response	1-20	38.1	11.2	24.7	3.5	17.2	2.0	13.1	1.3	6.9	0.5

* A = Percentage Change in Total Demand Accounted for by Each Quintile.
** B = Consumers' Welfare Loss as a Percentage of Income by Quintile.

Table 6
User Fee Simulations - Distributional Results (With Revenue Reinvestment)
Percentage Change in Demand by Income Quintile and
Consumers' Welfare Loss as a Percentage of Income by Income Quintile

Scenario	User* Fee Change	Quintile 1 (lowest)		Quintile 2		Quintile 3		Quintile 4		Quintile 5 (highest)	
		A*	B**	A	B	A	B	A	B	A	B
No Pri. Doctor	1-10	-7.5	1.7	-2.9	0.4	2.3	-0.1	3.8	-0.3	6.1	-0.6
Price Response	1-20	-23.8	4.9	-14.1	1.7	-6.2	0.6	-0.8	0.1	3.8	-0.4
Equal Pri. Doctor	1-10	-18.7	4.5	-9.4	1.1	-2.8	0.3	1.0	-0.1	4.1	-0.4
Price Response	1-20	-44.8	10.0	-26.0	2.9	-13.8	1.3	-7.1	0.6	1.0	-0.2

* A = Percentage Change in Demand Within Each Quintile.
** B = Consumers' Welfare Loss as a Percentage of Income Within Each Quintile.

Table A
Hedonic Price and Travel Time Repressions

Independent Variable	Private Doctor Price		Private Doctor Travel Time		Hospital Travel Time		Clinic Travel Time
	Lima	Sierra	Lima	Sierra	Lima	Sierra	
Constant	1.99 (3.50)	3.78 (6.51)	2.14 (1.79)	0.71 (0.39)	1.88 (2.28)	0.95 (0.49)	3.29 (2.05)
Age	0.18 (0.94)	0.46 (2.48)	-	-	-	-	-
Acute Illness	0.34 (0.73)	-0.54 (1.06)	-	-	-	-	-
Respiratory Illness	0.12 (1.02)	0.07 (0.50)	-	-	-	-	-
Digestive Illness	-0.07 (0.41)	-0.23 (1.01)	-	-	-	-	-
North Cone of Lima	-0.14 (0.87)	-	0.45 (0.97)	-	-0.34 (1.13)	-	1.99 (1.69)
South Cone of Lima	-0.14 (0.96)	-	-0.64 (1.52)	-	-0.91 (2.46)	-	-1.12 (1.47)
North Sierra	-	-0.72 (2.57)	-	-0.46 (0.72)	-	1.76 (1.31)	-0.33 (0.47)
South Sierra	-	-0.25 (0.60)	-	-0.31 (0.29)	-	1.46 (1.37)	-0.16 (0.47)
# of Doctors in District	-	-0.01 (1.25)	-	0.03 (1.68)	-	-	-
# of Hospital Beds in District	-	-0.00 (3.40)	-	-	0.01 (1.98)	-	-
# of Clinics in District	-	-0.18 (3.66)	-	-	-	-	-
District Population	-	2.42 (1.46)	-	4.72 (2.11)	-	5.13 (2.51)	-
District Pop. Sq'd.	-	-2.72 (2.11)	-	-1.86 (1.45)	-	-2.88 (2.50)	-

Table A
Hedonic Price and Travel Time Repressions
(Continued)

Independent Variable	Private Doctor Price		Private Doctor Travel Time		Hospital Travel Time		Clinic Travel Time
	Lima	Sierra	Lima	Sierra	Lima	Sierra	
Good Road Dummy	-	-	-	1.30 (2.04)	-	0.66 (1.05)	0.86 (1.73)
Hospital Selection Term	-1.51 (1.99)	-0.64 (1.09)	2.25 (1.43)	1.91 (0.74)	-	-	3.80 (1.39)
Clinic Selection Term	2.21 (2.54)	1.99 (2.20)	-1.07 (0.63)	-2.21 (1.01)	-1.41 (1.09)	-5.13 (1.33)	-
Private Doctor Selection Term	-	-	-	-	2.07 (1.22)	-0.75 (0.22)	-4.57 (1.39)
Self-Care Selection Term	-0.62 (1.04)	-0.80 (1.28)	-0.83 (0.57)	0.22 (0.12)	-0.36 (0.24)	5.42 (1.54)	0.88 (0.47)

II Non-Price Rationing for Medical Care; The Case of Cote d'Ivoire

I. Introduction

Many developing countries have created extensive publicly supported health care systems, whose services are typically provided at little or no monetary cost. The rational behind these subsidies is to insure that all income groups have equal access to medical care.[1/] However, in the absence of user fees (access charges), equal access is still not assured. It has been well known since Acton (1975) that indirect access prices, such as travel time, are important determinants of health care choices, and when direct prices are small, these indirect costs become the dominant rationing device. Travel time is expected to be a particularly powerful rationing devise in poor developing countries, where the majority of the population inhabit rural areas and health infrastructures are concentrated in cities. The purpose of this paper is to investigate the impact of travel time on the demand for health care in rural Côte d'Ivoire.

Most of the previous studies on the demand for medical care in developing countries have found little if any impact of prices and travel time on demand. These studies model the demand for health care as a discrete choice amongst alternative providers, with the price effect specified to be independent of income. [2/] This assumption is extremely restrictive, since one would expect the wealthy to be less sensitive to price differences amongst providers than the poor. Gertler, Locay, and Sanderson (1986) show that this specification is inconsistent with stable utility maximization, and that the price elasticity of demand must decline with income for health to be a normal good. They derive a discrete choice specification from a theoretical model that implies a natural interaction between price and income in the demand functions. Their empirical results for Peru show that prices are important determinants of health care demand, and that demand indeed becomes more elastic as income falls.

All of the previous studies specify access costs such as travel time as a non-monetary nuisance parameter in the utility function, implying that their coefficients are interpreted as the marginal disutility of traveling. Acton (1975) points out that the monetary outlays associated with these access costs should enter the budget constraint in the same way as the direct price of medical care. This study extends the specification in Gertler, Locay, and Sanderson (1986) by including access costs directly in the budget constraint as well as a non-monetary nuisance parameter in the utility function.

Previous studies also estimate a Multinomial Logit (MNL) discrete choice model. The MNL suffers from the Independence of Irrelevant Alternatives property which restricts the cross-price elasticities to be equal across alternatives. Instead, we employ a Nested Multinomial Logit (NMNL) specification which allows non-equal cross-price elasticities and has the MNL nested as a special case. Further, we estimate the NMNL by Full Information Maximum Likelihood (FIML) rather than the more popular two-step procedure. Hensher (1986) reports that FIML achieves large efficiency gains over the two-step procedure for NMNL.

The model is estimated using data from the World Bank's Living Standards Measurement Survey of Côte d'Ivoire. Our findings indicate that travel time plays an important role in determining health care utilization both as a price and as a nuisance parameter. The results also show that health care demand amongst poorer individuals is substantially more travel time elastic than amongst richer individuals. Further, specification tests reject the MNL in favor of the NMNL.

The paper is organized as follows. In Section II and III we develop the model and the empirical specification. The data and institutional environment are discussed in Section IV. The results are presented in Sections V and VI. Finally a short summary is provided in Section VII.

II. Behavioral Assumptions

The framework for this discussion is a model in which utility depends on health and the consumption of goods other than medical care. Health is valued both as a consumption good and as an investment in productivity. If an illness or accident is experienced, individuals must decide whether to seek medical care. The benefit from consuming medical care is an improvement in health, and the cost of medical care is a reduction in the consumption of other goods. Individuals have to decide not only whether to seek care, but also what type of care. They are faced with a set of alternative providers, each of which has a different potential impact (efficacy) on their health. This efficacy depends on providers' skills, individuals' characteristics (e.g. medical problems, general health status, and ability to implement the recommended treatment plan), and a random term that captures the notion that the efficacy of medical care is not deterministic. An individual's expectation of this impact can be viewed as the perceived quality of care.

In essence, individuals are faced with a discrete choice decision. A choice must be made between the various provider alternatives, including self-care. Each alternative offers a set package (quality) for a given price, where the price includes both monetary outlays and access costs such as travel and waiting time. Access costs enter the utility maximization problem in both monetary and non-monetary forms. They enter in monetary form via the budget constraint, and in non-monetary form as a nuisance argument of the utility function. For example, the cost of traveling to a provider is a monetary access cost and the disutility from the time spent traveling is a non-monetary access cost. Based on this information, their health status, types of medical problems, and incomes, individuals choose the alternative that yields the greatest utility.

The utility maximization problem is specified as a two stage budgeting process. Utility is assumed to be separable in health and non-medical consumption. Individuals first decide how to divide their budget between health care and other consumption, and then choose the components of their consumption bundles. Since we are only concerned with the first stage, total expenditures on non-medical goods enter the utility function directly.

Formally, let utility conditional on receiving care from provider j, be given by

$$(1)\quad U_j = U(H_j, C_j, T_j),$$

where H_j is expected health status after receiving treatment from provider j, C_j is expenditures on consumption after paying provider j, and T_j is the travel time to provider j.

The health care purchased from provider j is invested in health. The perceived quality (marginal product) of provider j's medical care is the expected improvement in health. Let H_0 be expected health status without professional medical care (i.e. self-treatment). Then, the perceived quality of provider j's care is

$$Q_j = H_j/H_0,$$

which yields an expected health care production function of the form

$$(2) \quad H_j = Q_j H_0,$$

where H_j is proportional to H_0. This production function takes on a rather simple form for the self-care alternative. Since H_j equals H_0, the proportionality factor is unity for the self-care alternative. In effect, this normalizes the health care production function so that the quality of a particular provider's care is measured relative to efficacy of self-care.

Let $P*_j$ be the total monetary price of provider j's care and Y be income, then the budget constraint is

$$(3) \quad C_j + P*_j = Y,$$

with $C_j \geqq 0$ required for feasibility. The consumption of medical care is an investment in productivity, which affects income. In rural farming households, this period's work determines next period's income. Hence, this period's income is exogenous to this period's health care decisions.

The total price of medical care includes both the direct payment to the physician and the price of access (e.g. the cost of travel time). Substitution of (3) into (1) for C_j yields the conditional indirect utility function

$$U_j = U(H_j, Y - P*_j, T_j).$$

Notice that income affects utility through the consumption term, and that the price of medical care is foregone consumption.

Now we are ready to specify the utility maximization problem. Suppose the individual has J+1 feasible alternatives (with the j=0 alternative being self-care). The unconditional utility maximization problem is

$$(4) \quad U^* = \max(U_0, U_1, \ldots, U_J),$$

where U^* is the highest utility the individual can attain.

If health is a normal good, then the demand for health increases with income. A necessary condition for normality is that as income rises, the marginal rate of substitution of consumption for health diminishes, holding health constant. This point is demonstrated in figure 1, where the continuous choice case is pictured. As income rises the point of utility maximization moves out from the origin along the expansion path. Holding health constant at $\overline{H}$, we move to the right along the horizontal line as income rises. Thus, as income rises, the $\overline{H}$ line intersects the indifference curves at points of flatter slopes, implying a diminishing marginal rate of substitution.

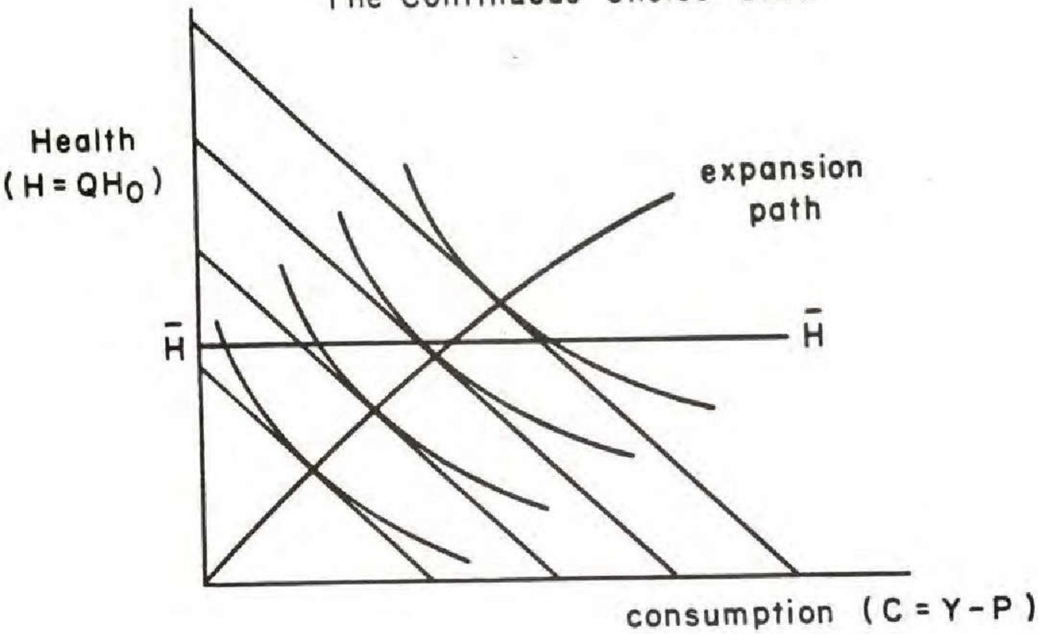
In a discrete choice world, health being a normal good implies that as income rises individuals are more likely to choose the higher price/higher quality options. This demonstrated in figure 2, where the discrete choice case is pictured. In figure 2, there is a choice between a high price/high quality option (Q_h, P_h), and a low quality/low cost option (Q_l, P_l). At a low income level, say Y_l, the choice is between points A and B [i.e. between a gain in health of $(H_h - H_l)$ and a gain in consumption of $(P_h - P_l)$]. At income Y_l, the gain in consumption is preferred to the gain in health and the low cost/low quality option B is chosen. As income rises the marginal rate of substitution of consumption for health falls along both horizontal lines H_h and H_l. Hence, as income rises the marginal utility of health relative to consumption rises. Eventually (at income Y_h in figure 2) the gain in health is preferred to the gain in consumption, and the high quality/high price option C is chosen.

Therefore, in a discrete choice world, if health is a normal good, a rise in income increases the likelihood that individuals purchase higher quality/higher cost alternative. Another way of looking at this is that an increase in price is less likely to dissuade richer individuals from choosing the higher quality/higher cost alternatives. In a probabilistic sense, this implies that richer individuals are less price elastic than poorer individuals.

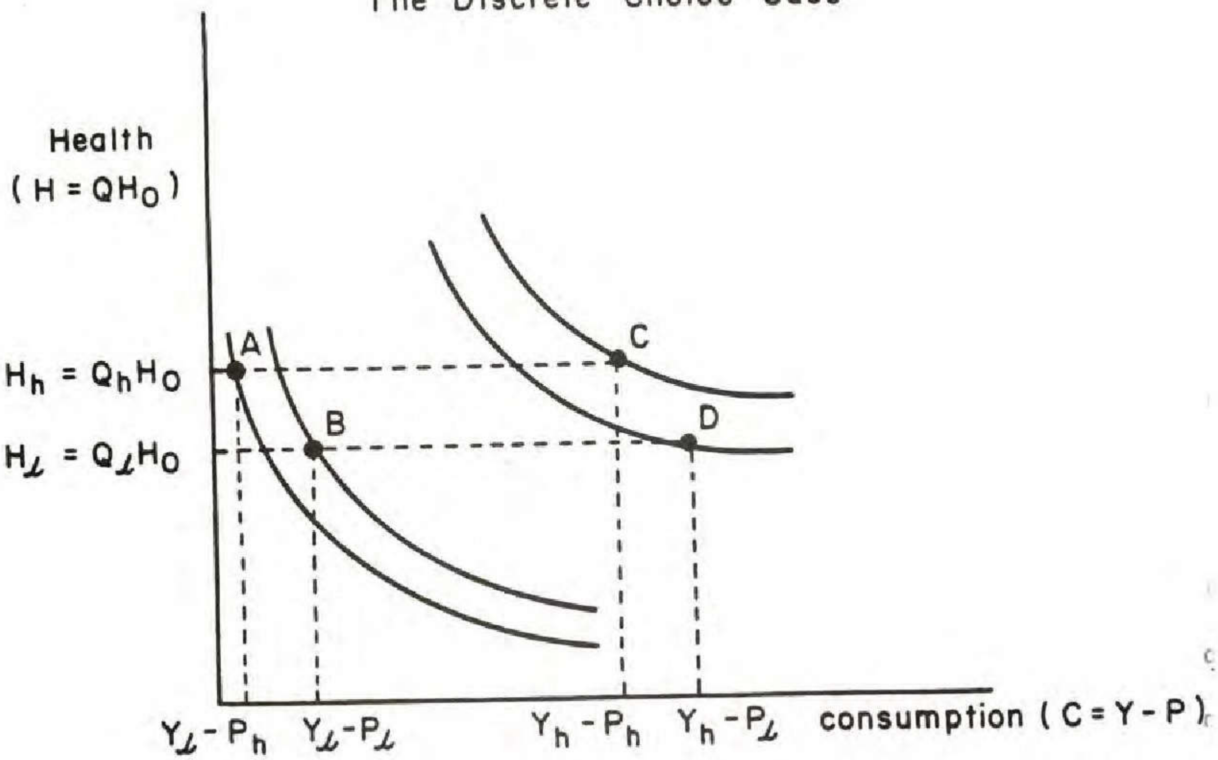
III. Empirical Specification

The solution to (4) yields a system of demand functions, whose forms will be probabilities that the alternatives are chosen. The probability that a particular alternative is chosen equals the probability that this alternative yields the highest utility amongst all the alternatives. The functional form of the demand functions depends on the functional form of the conditional utility function and the distribution of the stochastic variables.

The Continuous Choice Case



The Discrete Choice Case



A. The Conditional Utility Function

As discussed in the previous section, the conditional utility function must allow for a diminishing marginal rate of substitution. Since a linear function imposes a constant marginal rate of substitution, it is rejected. Further, we reject a linear specification with provider specific coefficients on consumption, as that would imply that the marginal rate of substitution varies by alternative for the same values of quality, price and income. A specification that avoids these pitfalls is the Cobb-Douglas utility function.

The arguments of the jth conditional utility function are the expected level of health after receiving care from provider j, consumption of non-medical care goods, and the travel time nuisance parameter. At this point it is convenient to specify utility to be explicitly a function of health as a consumption good and of health as an investment in earnings ability. The return to health as an investment, is its productivity effect on next year's income. Let Y_{2j}, be next year's expected income conditional on the individual having health H_j. Substitution of (2) and (3) into a Cobb-Douglas conditional utility function yields the conditional indirect utility function.

$$(5) \quad U_j = \ell n(H_0) + \ell n(Q_j) + \alpha_1 \ell n(Y - P_j^*) + \alpha_2 \ell n(T_j) + \alpha_3 \ell n(Y_{2j})$$

In equation (5), $\ell n(H_0)$, $\ell n(Q_j)$ and $\ell n(Y_{2j})$ are not observed. Since $\ell n(H_0)$ appears in the utility function for all the choices and its value does not vary by alternative, it does not influence which alternative is preferred, and therefore can be ignored. To get around the unobservability of $\ell n(Q_j)$, we specify a quality (marginal product) function for each provider type. Specifically, let the expected quality from provider j be

$$(6)\quad \ell n(Q_j) = \beta_{0j} + \beta_{1j}X + \beta_{2j}Z_j + \varepsilon_j,$$

where X is a vector of the individuals' characteristics (e.g. measures of health status, severity of illness, education), Z_j is a vector of characteristics of provider j, and ε_j is a zero mean random disturbance with finite variance.

A similar approach is used to bypass the unobservability of $\ell n(Y_{2j})$. Next period's income is determined from the household production function, which is a function of the levels of inputs (e.g. labor, land, capital, rain, etc.). The marginal productivity of any of the inputs depends on the individual's health. Since health depends on the productivity of the medical care consumed, the parameters of the function vary by alternative. As was done with quality, we normalize the health investment effect relative to the self-care alternative. This involves differencing $\ell n(Y_{2j})$, income in year 2 after provider j is chosen, from $\ell n(Y_{20})$,income in year 2 after the self-care alternative is closer. Let the return in terms of next year's income of provider j's care relative to self-care be given by

$$(7)\quad \ell n\ (Y_{2j}) = \ell n\ (Y_{20}) + \gamma_{0j} + \gamma_{1j}\ \ell n\ (S),$$

where S is the vector of farm inputs.

The reduced form conditional utility function for alternative j is found by substituting (6) and (7) into (5). Specifically, for alternatives $j=1,\ldots,J$, the conditional utility function is

$$(8)\ U_j = (\beta_{0j} + \gamma_{0j}) + \beta_{1j}X + \beta_{2j}Z_j + \alpha_1 \ln(Y - P_j^*) + \alpha_2 \ln(T_j) + \gamma_{1j} \ln(S_j) + \varepsilon_j$$

Note that the intercept and the coefficients of X, Z and S vary by alternative, as do the values of consumption and access costs (but not their coefficients). The restrictions that H_j equals H_0, that the coefficients of the farm inputs are normalized relative to the self-care alternative, and that P_0 is assumed to be zero imply that the conditional utility function for the self-care alternative reduces to

$$U_0 = \alpha_1 \ln Y + \varepsilon_0.$$

B. The Budget Constraint

The full price of provider j's medical care is

$$(9)\quad P_j^* = P_j + wT_j.$$

where P_j is the direct payment to provider j and w is the opportunity cost of time. Substitution of (9) into the conditional utility function in (8) yields

$$(10)\ U_j = \beta_{0j} + \gamma_{0j} + \beta_{1j} X + \beta_{2j}Z_j + \alpha_1 \ln(Y - P_j - wT_j) + \alpha_2 \ln(T_j) + \gamma_{1j} \ln(S) + \varepsilon_j$$

In order to simplify the estimation we use an approximation to the log of consumption. The log of consumption can be expressed as

$$(11) \quad \ln(Y - P_j - wT_j) = \ln(Y) + \ln\,(1 - (P_j + wT_j)/Y)$$

Since $(P_j + wT_j)/Y$, the budget share of alternative j, is expected to be small, the second term in (11) can be approximated by $-[(P_j + wT_j)/Y]$. Substitution into (10) for the log consumption term yields

$$(12) \quad U_j = V_j + \varepsilon_j$$

where

$$(13)\ V_j = \beta_{0j} + \gamma_{0j} + \beta_{1j}X + \beta_{2j}Z_j + \alpha_1\ln(Y) - \alpha_1[(P_j + wT_j)/Y] + \alpha_2\ln(T_j) + \gamma_{1j}\ln(S)$$

Notice that the $\alpha_1\ln(Y)$ term in (13) is the same across all alternatives, including self-care. Since only differences in utility across alternatives matter, this term has no effect on provider choice, and therefore, can be omitted. Thus, the deterministic portion of the self-care utility function reduces to $V_0 = 0$.

Earnings affect the model in two ways. First, as discussed above, income enters the budget constraint, and second, the wage rate enters via the access cost as the value of time. The access cost to a provider is the product of the individual's wage rate (value of time) and the time spent traveling to see the provider. If health is a normal good, then an increase in income, holding the wage constant, raises the probability that the high quality/high cost alternative is chosen. Alternatively, an increase in the wage rate, holding income constant, is tantamount to a price rise, thus reducing the probability that the provider is chosen.

C. The Demand Functions

The demand function for an alternative is the probability that its utility is greater than from any of the other alternatives. Previous studies have assumed that these demand functions take on a multinomial logit (MNL) form. As discussed in McFadden (1981), the MNL suffers from the Independence of Irrelevant Alternatives assumption. This assumption is equivalent to assuming that the conditional utility functions are uncorrelated across alternatives, and imposes the restriction that the cross-price elasticities are the same across alternatives. A computationally feasible generalization to the MNL is the Nested Multinomial Logit (NMNL), (McFadden, 1981). The NMNL allows correlation across subgroups of alternatives, and therefore, non-constant cross-price elasticities across subgroups. Another advantage of the NMNL is that the MNL is nested within it, providing us with a specification test.

The health care choices in the Côte d'Ivoire data set are hospital, clinic, and self-care. Let us group the hospital and clinic alternatives together, and allow the conditional utility functions to be correlated for these alternatives. In this case, the self-care demand function (i.e. the probability of choosing self-care) is:

$$\Pi_0 = \frac{\exp\,(V_0)}{\exp\,(V_0) + \exp\,(\sigma I)}$$

and the probability of choosing provider j is:

$$\Pi_j = \left(\frac{\exp(\sigma I)}{\exp(V_0) + \exp(\sigma I)}\right) \left(\frac{\exp(V_j)}{\exp(I)}\right),$$

where

$$I = \log\left(\sum_{k=1}^{J} \exp(V_k)\right),$$

and V_j is given in (13). Since $V_o = 0$, $\exp(V_o = 1)$. The coefficient σ in the demand equations is one minus the correlation of the hospital and clinic conditional utility functions. When $\sigma = 1$, the NMNL reduces to an MNL.

IV. Data

The data used in this study are drawn from the Ivorian Living Standard Survey (ILSS). This multi-purpose household survey, which aims at measuring many socioeconomic factors relevant to the living standards of Ivorian households, was started in February 1985. 3/ During the first 12 month period, 1588 households were interviewed of which 950 were located in rural areas. Approximately 93 percent of these households are farming households. The other households were deleted from the sample. Detailed information on health-care utilization was obtained from all household members who reported an illness or injury during the four weeks prior to the interview. The ILSS also contains extensive information on many socioeconomic aspects relevant to the demand for medical care.

In addition to household data, the ILSS collected community level information in rural areas. The rural component of the household survey was comprised of 56 sample clusters, which roughly correspond to small villages. However, the community survey was completed in only 52 rural clusters. Relevant to the current study is the data on the availability of various types of health care facilities and community wage rates. Travel time is reported for the nearest available facility of each type (hospital, clinic, maternity center, etc.). When a provider is available in the village, travel time is recorded as zero. In addition, male and female agriculture wage rates were collected for each community.

The final estimation sample is drawn from the pool of adults in 49 clusters or villages, and contains 1030 individuals over the age of 15. Four clusters where excluded either because travel times were not known or because they were obviously misreported. Further, since the study focused on primary health care, visits associated with obstetric care (maternity centers) were excluded from the final sample as well. There were only 19 such cases. In order to focus on primary curative health care, the sample was further restricted to those individuals reporting an illness. Summary statistics of the data are reported in Table 1.

Since there is no private health care in rural Côte d'Ivoire, persons who wish to obtain medical care must choose between government clinics and outpatient wards of government hospitals. Of the 49 villages in the sample, 10 had clinics on the premise. There was no village with a hospital on premise, although in one case a hospital was as close as 6 minutes away. Thirty villages were served by hospitals further away than clinics. In 19 villages, hospital outpatient wards and clinics were equidistant. Maximum travel time (in one direction) was 5 hours for hospitals and only 2 hours for clinics. The travel time access cost is measured as the product of the value of travel time to the nearest provider. The value of time is measured as the prevailing hourly wage rates in each cluster for adults males and females. Total household consumption is used as the household's total income measure.[4/]

The arguments of the quality production function are the health status of the individual, human capital, and provider characteristics. As measures of health status we include age and the number of days the individual was healthy during the past four weeks. The number of healthy days is calculated as 28 minus the number of days the individual reported being restricted from normal activities due to illness over the last four weeks. Human capital is measured in years of schooling. The human capital variable is years of education, but educational attainment is typically low; approximately 84% of the sample reported no schooling.

The inputs to the agricultural production function are hectares of land and available labor measured by the number of prime age adults in the household. Another important productivity factor is the number of children. Children may reduce the adult time available for farm production. Age, sex and education are also likely to affect productivity.

V. Results

The coefficients and associated t-statistics from full information maximum likelihood estimation of the NMNL model are presented in table 3. Overall, the results are consistent with economic theory and common sense. The estimated value of σ is 0.46 and is significantly different from one at the 5% level, implying that the data reject MNL specification. Travel time both as an access cost and as a nuisance parameter, appears to be an important

Table 1: Descriptive Statistics

Variable	Mean	Standard Deviation
Clinic a/	0.24	(0.42)
Hospital a/	0.15	(0.36)
Clinic travel time b/	0.58	(0.65)
Hospital travel time b/	0.93	(0.94)
Income c/	1.43	(1.27)
Hourly wage d/	65.56	(70.10)
Age	44.85	(17.12)
Male	0.46	(0.50)
Years of education	0.87	(2.21)
Healthy days	18.63	(9.93)
Number of adults	5.54	(4.64)
Number of children	5.29	(5.43)
Log (Land)	1.85	(0.84)
Sample Size	1030	

a/ Dummy variable, equal to one if alternative is chosen.

b/ Travel time is reported in hours.

c/ Income is reported in millions of CFA's. The exchange rate in 1985 was approximately 461 CFA's per U.S. dollar.

d/ Wage rate is reported in CFA's.

determinant of provider choice. The coefficient on time as an access cost is negative and significantly different from zero at the 5% level, and the coefficient on time as a nuisance parameter is negative and significant at the 10% level. More discussion about the magnitude of the travel time and income effects is presented in the next section.

The age effect is negative and significant (at the 1% level), and is substantially larger for hospitals than for clinics. There are two immediate explanations. The first is that medical care is less efficacious for older adults than it is for younger adults. For example, medical care has a greater impact on acute problems prevalent among the young than on chronic illnesses prevalent amongst the elderly. This is consistent with our empirical result that the demand for clinic care falls faster with age than the demand for hospital care. For chronic illnesses hospital care is likely to be more efficacious than clinic care. Another explanation follows from a motive to consume medical care as an investment in productivity. Grossman (1972) shows that the lower the marginal productivity of individuals, the smaller their investment in health. Elderly individuals are likely to be less productive in farm activities than prime age adults.

The effect of sex is not significantly different from zero in the clinic equation, and is positive and significant at the 1% level in the hospital equation. This result is consistent with males being more productive in farm activities than females.

The effect of education appears to be negligible. This most likely is a result of the small variation in education in the sample.

The farm input variables perform as expected. The number of adults in the household has a negative effect on the probability of going to both clinics and hospitals. The greater the number of adults, the larger the labor force and the lower the marginal productivity of an individual. The lower the marginal productivity, the smaller the return to the investment in health. The coefficients on the number of children in the household are positive. The greater the number of children (who take up adult time), the higher the marginal productivity of an adult. Finally, the coefficient on hectares of land is positive and significant in the hospital equation, which is consistent with the notion that the greater the amount of land, the higher the marginal productivity of an individual.

VI. Time Price Elasticities and Income Effects

Since travel time and income enter the demand functions in a highly non-linear fashion, it is hard to assess the total magnitude of the travel time and income effects. To facilitate such analysis, we present arc travel time elasticities of the demand for clinic and hospital care by income quartiles in table 3. The arc elasticities are found by sample enumeration within each income quartile. Four half-hour travel time ranges are used for the arc elasticities calculations. The zero to two hour time range covers approximately 90% of the households. A vertical reading of table 3 reflects the change in the time price elasticity moving down the demand curve, holding income constant. A horizontal reading reflects the change in the time price elasticity as income rises, holding travel constant.

Two types of elasticities are considered in table 3. The first type is the total own time price elasticity, which, for example calculates the total percentage change in clinic demand with respect to a 1% change in clinic travel time. An increases in clinic travel time causes some individuals to

Table 2: Nested Multinomial Logit Model of Provider Choice

	Coefficient	T-statistic
Access Cost $(\frac{wT}{Y})$ a/	-1.059	(2.18)
Nuisance parameter (T)	-0.289	(1.79)
Sigma	0.460	(2.69)
Clinic Alternative		
Constant	1.773	(1.70)
Age	-0.038	(2.01)
Sex	-0.042	(0.13)
Education	-0.077	(0.96)
Healthy days	-0.065	(1.91)
Adults	-0.122	(1.69)
Children	0.108	(1.65)
Log (land)	0.203	(0.79)
Hospital Alternative		
Constant	1.655	(1.53)
Age	-0.055	(2.92)
Sex	0.634	(1.74)
Education	0.093	(1.08)
Healthy days	-0.099	(2.82)
Adults	-0.122	(1.60)
Children	0.104	(1.59)
Log land	0.652	(2.54)
Log likelihood	-884.02	
N	1030	

a/ This variable was rescaled by multiplying it by 125 for estimation.

substitute hospital care for clinic care, and others to substitute self-care for clinic care. The second type of elasticity is the net elasticity, which examines the portion of demand that leaves the professional health care market. For example, it calculates the percentage of clinic demand that substitutes self-care for clinic care. The net elasticity has policy interest as it measures the number of individuals moving in and out of the professional health care market as a function of the distributional structure of health care supply.

We begin with a discussion of the own time price elasticities. Demand is substantially more elastic at higher travel times. Over the zero to two hour travel time range, the demand elasticities more than tripples. (Table 3). Specifically, the clinic demand elasticity for the lowest income quartile increases from -0.531 (for the 0 to 0.5 hour range) to -1.962 (for the 1.5 to 2.0 hour range). For the highest income quartile, the clinic demand elasticity increases from -0.230 to -0.854. Similar magnitudes are found for hospital demand.

The results also show that demand is vastly more elastic at the lower income levels. Specifically, the clinic demand elasticity for the lowest income quartile is more than double the elasticity for the highest income quartile. The clinic demand elasticities for the 0 to 0.5 hour interval range from -0.531 for the lowest income class to -0.230 for the highest income class. For the 1.5 to 2.0 hour interval, they range from -1.962 to -0.854. Again a similar pattern emerges for hospital care.

The net travel time elasticities, as expected, are lower than the own price elasticities, but not insignificant in magnitudes. This implies that significant numbers of individuals are forced out of the market due to travel time rationing. In the lowest income quartile, the net clinic demand elasticity rises from -0.387 for the 0 to 0.5 hour interval to -1.039 for the 1.5 to 2 hour interval, and the net hospital demand elasticity rises from -0.361 to -0.807. In the highest income quartile, the net clinic demand elasticity rises from -0.102 to -0.326, and the net hospital elasticity rises from -0.87 to -0.266.

VII. Summary

This paper investigates the role of travel time as a health care rationing device in a developing country. Previous studies on the demand for health care demand in developing countries have typically found small travel time effects. These studies model the demand for health care as a discrete choice amongst providers with travel time entering the utility function as a nuisance parameter, and with the price effect specified to be independent of income. We derive a discrete choice specification from a theoretical model that has a natural interaction between price and income, and that includes travel time in the budget constraint as an access price, as well directly in the utility function as a nuisance parameter.

A Nested Multinomial Logit parameterization of the model was estimated using 1985 data from Côte d'Ivoire. Our findings indicate that indirect access costs such as travel time play an important role in rationing health care utilization. The results also show that health care demand amongst poorer individuals is substantially more travel time elastic than amongst the rich.

Table 3: Arc and Net Travel Time Elasticities

Travel Time-Range (hours)	Quartile 1 (lowest)		Quartile 2 (lowest)		Quartile 3 (lowest)		Quartile 4 (highest)	
	Own	Net	Own	Net	Own	Net	Own	Net
Clinics								
0 - 0.5 hour	-0.531	-0.387	-0.339	-0.203	-0.293	-0.148	-0.230	-0.102
0.5 - 1.0 hour	-0.991	-0.638	-0.646	-0.355	-0.545	-0.256	-0.415	-0.174
1.0 - 1.5 hours	-1.486	-0.861	-1.003	-0.510	-0.835	-0.367	-0.625	-0.250
1.5 - 2.0 hours	-1.962	-1.039	-1.392	-0.660	-1.150	-0.479	-0.854	-0.326
Hospitals								
0 - 0.5	-0.696	-0.361	-0.439	-0.194	-0.341	-0.136	-0.226	-0.087
0.5 - 1.0	-1.242	-0.557	-0.812	-0.330	-0.618	-0.231	-0.403	-0.147
1.0 - 1.5	-1.722	-0.691	-1.222	-0.465	-0.924	-0.326	-0.598	-0.207
1.5 - 2.0	-2.128	-0.807	-1.648	-0.593	-1.250	-0.422	-0.807	-0.266

NOTES

1/ See Ainsworth (1983), de Ferranti (1985) and Jimenez (1986) for a discussion on health care pricing methods in developing countries.

2/ Studies of the demand for health care in developing countries include Akin et.al. (1981, 1985 and, 1986), Birdsall and Chuhan (1983) and (1986), Dor and van der Gaag (1987), Gertler, Local, and Sanderson (1986), Heller (1983), Musgrove (1983), and Mwabu (1986).

3/ For detailed information on this survey, see Grootaert (1985), and Ainsworth and Muñoz (1985).

4/ For a description on how total household consumption was calculated see Glewwe (1986).

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LIVING STANDARDS MEASUREMENT STUDY

The Living Standards Measurement Study (LSMS) was established by the World Bank in 1980 to explore ways of improving the type and quality of household data collected by Third World statistical offices. Its goal is to foster increased use of household data as a basis for policy decision making. Specifically, the LSMS is working to develop new methods to monitor progress in raising levels of living, to identify the consequences for households of past and proposed government policies, and to improve communications between survey statisticians, analysts, and policy makers.

The LSMS Working Paper series was started to disseminate intermediate products from the LSMS. Publications in the series include critical surveys covering different aspects of the LSMS data collection program and reports on improved methodologies for using Living Standards Survey (LSS) data. More recent publications recommend specific survey, questionnaire and data processing designs, and demonstrate the breadth of policy analysis that can be carried out using LSS data.

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ABSTRACT

This paper reviews the health status of The Peruvians and the financing and spending patterns of Peruvian health institutions. Between 1975-85 declining income per capita of the population has been accompanied by unsuccessful attempts to reduce total government expenditures. However, government expenditures in social programs declined from one third of the budget in 1973-75 to less than one fifth in 1981. Expenditures in health programs as a proportion of the government budget declined from 6.4 percent in 1970 to around 4.5 percent in 1980-85 (to 0.6 percent of the GDP). This amounts to approximately 5.0 U.S. dollars per capita. Central government revenues the main source of financing of public health institutions. Expenditure by corporate health institutions and private institutions and individuals account for approximately 90 percent of total resources spent on health related goods and services. Corporate institutions spent around 100 U.S. dollar per "affiliated" member, private individuals spent between 10 and 20 U.S. dollars per capita. These findings call for the need to explore the actual scope of health government programs and the role that nongovernment institutions may play in implementing health programs.

Child and infant mortality and the high incidence of environmental related diseases appear as the most critical health problems in Peru. Observed mortality and morbidity patterns and the tendency of Peruvian health institutions to concentrate on curative rather than preventive services, suggest that there might be a misallocation of resources. Analysis of health related indicators also show a high degree of inequality in the spatial distribution of health resources and sanitation services.

Table of Contents

INTRODUCTION

This paper reviews the health status of the Peruvians and the financing and spending patterns of Peruvian health institutions. The paper analyzes the main trends and relative importance of institutions providing health services and explores such alternative financing policies as users' fees, cost-recovery programs, and community participation. It also analyzes the potential for implementing risk-sharing programs. Although the emphasis is on public institutions, the study presents data on corporate health institutions -- institutions that include the Peruvian Institute of Social Security (IPSS), the for-profit and nonprofit organizations of the private sector, and the health services of the army, corporate government, and private institutions.

The paper has four sections. Section 1 describes the evolution of the Peruvian economy during the last fifteen years. Section 2 analyzes the relative importance of each part of the health sector in terms of coverage, number of facilities, and financial resources. Section 3 presents the main indicators of the health status of the population, the major health problems affecting the Peruvian population, and the issues associated with the distribution of facilities, manpower, and financial resources. This section also reports on some of the findings from studies using data from the 1984 Nutrition and Health National Survey (ENNSA) in Peru. Section 4 summarizes the findings on the major problems affecting the health sector.

1. THE PERUVIAN ECONOMIC SITUATION, 1970-85

1.1 Growth, Inflation and Income

The dynamics of Peru's economic growth during the last twenty years have been shaped by two completely different approaches to managing the economy: a period of nationalistic popular reforms from 1968 to 1975 followed by a period of stabilization, structural adjustment, and liberalization from 1975 to 1985.

During the first period, a self-proclaimed Revolutionary Government of the Armed Forces seized power and promised to implement drastic social reforms such as nationalization, agrarian reform, educational reform, worker participation in the management of firms (Comunidad Industrial), and promotion of cooperatives and "social property." The government undertook large investment projects and nationalized certain strategic industries. It introduced subsidies for oil, gasoline, and basic staple foods; prices of other basic products were also controlled and/or heavily subsidized. The government severely restricted foreign trade by increasing the existing tariff rates and by introducing many nontariff restrictions.

The second period began in 1975 with a coup d'état against the reformist military government. A group of more conservative militarists seized power and called for a return to a more orthodox management of the economy, with more reliance on the private sector. In an attempt to reduce government deficits and disequilibrium in the external sector, the new government drastically reduced subsidies and dismantled several social reforms of the first period. The government was committed to a program of stabilization and the reorientation of the economy toward a free-market strategy of growth. A new civilian government came to power in 1980. Without changing the basic orientation in the management of the economy this government began consecutive drastic but unsuccessful stabilization programs. It also began a medium-term strategy of structural adjustment leading toward trade liberalization.

Data in Table 1.1 show the behavior of some of the macroeconomic aggregates during the two periods. During the 1970-75 period of popular reforms, average yearly rate of gross domestic product (GDP) growth was 4.8 percent, slightly below the historically high rate of 5.5 percent a year in the fifties and sixties. With a population growth rate of 2.7 percent a year, per capita income increased at an average rate of 2.04 percent. Also during this period inflation rose from a historically low yearly rate of about 5 percent to 13 percent in 1975 and 30 percent in 1976.

During the 1975-85 adjustment and liberalization period, while the population growth rate declined to 2.6 percent, the average rate of GDP growth dropped to 1.23 percent a year; per capita income declined by an average yearly rate of 1.23 percent. Inflation skyrocketed from 30 percent during the mid-seventies, to 60 percent in 1980, 110 percent in 1984, and 170 percent in 1985. Economic recession was particularly severe during the last five years of the structural adjustment and trade liberalization programs.

Between 1980 and 1985 the economy remained almost stagnant; GDP fell at a rate of 0.7 percent a year, and per capita income declined even faster at 3.4 percent a year. In 1985 income per capita was about 6 percent lower than at the beginning of the seventies.

TABLE 1.1: **Peru: Gross Domestic Product, Inflation, Population, Per Capita Income, 1970, 1975, and 1980-85**

	1970	1975	1980	1981	1982	1983	1984	1985
Real GDP,(bill. 1980 US$)	6.2	12.2	14.5	16.7	14.4	11.1	10.0	14.2
Rate of growth (p.a. real terms)	5.0	-0.5	0.1	3.1	0.6	-12.5	4.4	1.9
Inflation rate	5.0	13.0	59.2	75.4	64.4	111.2	110.2	169.9
Population (millions)	12.8	14.6	16.6	17.0	17.4	17.9	18.4	18.9
Income Index (1970=100) (real terms)	100.0	110.7	113.9	114.6	112.8	95.9	97.4	96.7

Source: Elaborated data from INE (1986); Suarez, R. (1986)

1.2 Government Finances: Revenues, Expenditures, and Deficits

Since the mid-seventies, management of government finances and control of government deficits have been among the key issues of Peru's stabilization programs. Data on the evolution of government finances are presented in Table 1.2.

During the first phase of the military government, after two years of austerity measures and policy reforms (1969-70), the government pursued expansionary fiscal policies. Government expenditures, as a proportion of the GDP, increased from an average of 16-18 percent during previous years to above 20 percent during the early seventies. Revenues did not increase in proportion, and domestic and foreign borrowing were heavily used to finance rising government deficits.

During the stabilization and liberalization period, efforts to reduce government expenditures were unsuccessful. At the beginning of the seventies, government expenditures represented about 17 percent of GDP; in the mid-seventies, they rose to almost 20 percent and have remained around this level in the eighties. For examples, in real terms, government expenditures increased considerably. In 1981 government expenditures in real terms were almost twice the level observed in 1970. Between 1975 and 1980, government revenues also rose substantially. From 1980 on, however, while government expenditures remained high, government revenues began to fall.

TABLE 1.2: **Peru: Public Sector Finances, 1970, 1975, 1980-85**
(millions of intis)

	1970	1975	1980	1981	1982	1983	1984	1985
GDP 1980 intis (000')	3364.7	4247.4	4971.8	5123.3	5168.9	4549.6	4765.8	4842.4
Real Rate of growth	5.0	-0.5	0.1	3.1	0.6	-12.5	4.4	1.9
GDP Current Prices	240.7	550.2	4971.8	8375.3	13777.0	25334.0	57114.2	155293.5
Deflactor GDP	7.2	13.0	100.0	161.5	266.5	556.8	1198.4	3207.0
Central Government								
Total Expenditure	42.1	106.7	1046.7	1830.2	2634.0	6048.0	10728.3	23869.0
Total Revenue	38.8	88.6	1008.4	1509.7	2459.6	3732.0	5228.1	21667.0
Deficit	-3.3	-18.1	-38.3	-320.5	-174.4	-2316.0	-5500.2	-2202.0
Expend. (1980 intis)	588.5	823.7	1046.7	1133.1	988.2	1086.1	895.2	744.3
Revenues (1980 intis)	542.4	684.0	1008.4	934.7	922.8	670.2	436.2	675.6
Expend. Index (1970=100)	100.0	140.0	177.9	192.5	167.9	184.6	152.1	126.5
Revenue Index (1970=100)	100.0	126.1	185.9	172.3	170.1	123.6	80.4	124.6
Total Government								
Expend/GDP (%)	17.5	19.4	21.1	22.1	19.1	23.9	18.8	15.4
Deficit/GDP (%)	-1.4	-3.3	-0.8	-3.9	-1.3	-9.1	-9.6	-1.4

Government deficits, around 3-4 percent of GDP between 1971 and 1974, increased to 6 percent in 1976 and 7.5 percent in 1977. At this time the government attempted to control government expenditures. Favorable export prices, resulting in additional export tax earnings, were used in part to balance the budget. Thus government deficits, as a proportion of GDP, were reduced to 4.7 percent in 1978, 0.5 percent in 1979, and 0.8 percent in 1980.

During the eighties, amidst a process of structural adjustment and liberalization, inconsistent expansionary fiscal and monetary policies were pursued. From 1980 to 1984 high government expenditures continued; in 1984 total government expenditures represented almost 24 percent of GDP. An unsuccessful reform of the tax system and the economic recession resulting from falling terms of trade led to a drastic reduction of government revenues. Deficits rose sharply from 2.8 percent of GDP in 1980 to more than 9 percent in 1983 and 1984.

Recurrent government deficits were financed by borrowing in domestic and foreign financial markets. Deficits were financed by an expansion of the money supply and intensive use of foreign financing, leading to severe inflation and an acute external debt. This evolving pattern of government finances explains the most important changes in the makeup of government expenditures, analyzed in the following section.

1.3 Government Revenues and Expenditure Patterns

Tables 1.3 and 1.4 present data on the composition of government revenues and expenditures for the years 1973, 1975, 1980, and 1982. Changes in revenue and expenditure patterns suggest that some important changes in income distribution might have occurred during these years. Reform of the tax system during the eighties reduced the usually progressive income tax and increased the usually regressive taxes on goods and services.

Overall, during 1973-82, tax revenues were the main source of government financing; taxes represented around 90 percent of total government revenues. Non-tax revenues, comprising fees on government services and grants, represented only 10 percent.

Government revenues from income taxes declined from 24.4 percent in 1973 to 15 percent in 1982; between 1973 and 1981 revenues from income taxes on individuals declined from 5.9 percent to 1.6 percent. Revenues from the general tax on goods and services for domestic and international transactions increased from 54.4 percent in 1975 to 71.4 percent in 1982. Revenues from taxes on payroll and from non-tax sources remained relatively constant. There are no revenues from the social security system because in Peru social security contributions are not paid to the government; they are directly paid to the Peruvian Institute of Social Security (IPSS), an autonomous institution.

Increases in government expenditures have not been uniform for all government functions. Between 1973 and 1981 the most important changes were reductions in the share of government expenditures on such social programs as health, education, housing and community activities.

Expenditures for these social programs declined from approximately one-third of the total budget in 1973-75, to less than one-fifth in 1981. The budget for education was reduced the most; less significant reductions were made in defense and general public services.

In 1981 a single item--other purposes--absorbed the largest proportion of total government expenditures. This item comprises mainly the interest and amortization payments on domestic and foreign public debt. Debt-related payments increased from 10 percent of government expenditures in 1973 to 21 percent in 1981. Estimates for 1984/85 show that these payments represented 25-27 percent of total government expenditures. 1/

TABLE 1.3: **Peru: Structure of Government Revenues, Selected Years (millions of intis)**

Government Revenues	1973	(%)	1975	(%)	1980	(%)	1982	(%)
Total Rev. and Grants	51.9	100.0	88.6	100.0	1008.4	100.0	2459.6	100.0
Tax Revenues	47.3	91.0	79.5	89.8	936.7	92.9	2232.7	90.8
Income Tax	12.7	24.4	21.0	23.7	267.9	26.6	369.6	15.0
Individual	3.1	5.9	5.0	5.6	16.4	1.6		
Corporate	8.8	17.0	11.1	12.5	247.8	24.6		
Social Security	0.0	0.0	0.0	0.0	0.0	0 0	0.0	0.0
Employers' Payroll Tax	1.8	3.4	3.4	3.8	33.9	3.4	108.8	4.4
Taxes on Property	1.9	3.6	3.5	4.0	56.2	5.6	146.3	5.9
On Goods and Services	18.6	35.8	31.8	35.9	380.4	37.7	1125.7	45.8
On Intntl. Transac.	9.6	18.6	20.8	23.5	283.0	28.1	630.8	25.6
Other Taxes	2.7	5.3	0.8	0.9	5.6	0.6	25.1	1.0
Non-Tax Revenues	4.5	8.7	9.0	10.2	70.5	7.0	221.3	9.0
Grants	0.1	0.2	0.1	0.1	0.9	0.1	5.7	0.2

Source: Elaborated from IMF (1984) p.645-47.

TABLE 1.4: **Peru: Government Expenditure Patterns, by Functions (millions of intis)**

Expenditure by Functions	1973	(%)	1975	(%)	1980	(%)	1981	(%)
Total Expenditure	64.2	100.0	106.7	100.0	1046.7	100.0	1830.6	100.0
General Public Service	8.8	13.6	13.1	12.2	129.2	12.3	191.2	10.4
Defense	9.8	15.2	16.7	15.7	130.7	12.5	252.9	13.8
Education	14.7	22.9	21.9	20.5	116.0	11.1	207.6	11.3
Health	3.5	5.5	5.5	5.1	47.4	4.5	97.1	5.3
Social Sec. & Welfare	0.2	0.2	0.3	0.2		0.0	2.8	0.2
Hous. & Commut. Act.	2.5	3.9	2.6	2.4	15.6	1.5	16.9	0.9
Other Community Serv.		0.0		0.0		0.0	23.0	1.3
Economic Sectors	14.4	22.4	26.3	24.6		0.0		0.0
Other Purposes (public debt payments)	7.2	11.2	20.5	19.2	202.1	19.3	389.8	21.3
Total Social Programs*	20.9	32.6	30.2	28.3	179.0	17.1	324.4	17.7

* Education, Health, Social Security and Welfare and Housing.

Source: Elaborated from IMF (1984) p.645-47.

In summary, the more intensive use of the general sales tax, rather than the income tax, and the reduction of government expenditures on social programs seem to have adversely affected income distribution. There is general agreement on the effects of this type of change in the system on income distribution; however, the effects on distribution that result from changes in government expenditures on social programs are less clear.

Data on the changing patterns of government revenues and expenditures also suggest that even when maintaining the regressive general sales tax, more revenue can be collected from individual and corporate income taxes. The problem seems to be one of political feasibility: increasing the tax burden of the politically strong high- and middle-income groups. Also, redistribution of expenditures toward social programs requires reducing the budget for defense and general services, reducing expenditures in the economic sectors, or reducing payments on the outstanding public debt, thus reducing the "other purposes" expenditures.

The alternative for the current government has been to limit the amount of resources to be used for amortization payments to foreign creditors and to reallocate these resources for social and economic programs. A short-term consequence of limiting such payments has been to have the Peruvian government declared "ineligible" for new loans by international organizations. Access to international capital markets has also been severely curtailed. Medium-term consequences of this situation are not yet foreseeable.

2. PUBLIC HEALTH SECTOR EXPENDITURE, 1970-85

2.1 The Peruvian Health Sector: An Overview

In theory Peru's National System of Health Services (Sistema Nacional de Servicio de Salud) is in charge of coordinating the health programs of government and nongovernment health institutions: the Ministry of Health (MOH), the Health Services of the Army and the Police, and the private health sector. But, as stated in the last National Health Plan, these institutions act independently of the National Health Services, and their actions lack coordination. In practice they are autonomous institutions with their own programs. The only institution under direct government policy intervention is MOH. 2/

To analyze the financing of the health sector, Peruvian health institutions are classified into three groups: (1) public health sector, comprising all institutions providing both preventative and curative health services to the general public. Access to these services is determined mainly by space availability and quotas; in some cases these institutions charge a nominal fee. (2) The corporate health sector, comprising institutions providing essentially curative health services to associated members or employees; payment for services are included as fringe benefits or retained from wages or salaries as contributions to a risk-sharing fund. Only the insured or affiliated members have access to these services. (3) The private health sector, comprising those individuals and institutions providing formal and informal curative care by implicit or explicit price-rationing schemes; access to the system is based on space availability and price rationing, or ability to pay.

This classification distinguishes among the types of health services provided by the various health institutions and identifies factors determining supply of (provision) and demand for these services. The first broad distinction is preventative and curative health services. Preventative includes those actions - that by their nature - can be classified as public goods. Marketable preventative actions will be considered as curative services. They can be thought of as a composite commodity consisting of medical care and instructions, drugs, and other factors affecting a particular treatment.

In Peru, preventative actions are the responsibility of public health institutions: MOH and local government institutions. Curative services are provided by all the institutions of the health sector. Public and private health institutions provide only medical care; corresponding drugs and other health-related goods and services are the patient's responsibility (for outpatients). The corporate health sector, however, provides both medical care and prescription drugs. These are important issues that should be considered in modeling health services and in evaluating the efficiency of each health institution.

Table 2.1 presents rough estimates of the relative importance of the three health sectors in the Peruvian economy by the number of centers, for example, hospitals and sanitary posts, and by the proportion of the population covered by each of the sectors. [3]

MOH is the most important institution of the public health sector both in the number of centers under its supervision and the number of people served. Sociedades de Beneficencia Publica and the local governments have fewer facilities; however, they provide services to relatively large segments of the population. As a whole, public health institutions have about one-third of the total number of hospitals, more than 70 percent of the health-care centers, and about 90 percent of the sanitary posts. These institutions serve an estimated 56.5 percent of the total population.

The corporate health sector, consisting of public- and private-funded institutions, provides health services to affiliated employees, members, and their relatives. These include IPSS; the Health Services of the Army and the Police (Sanidad de las Fuerzas Armadas y Fuerzas Policiales); and such state-owned health institutions and private enterprises such as Minero Peru, Southern Peru Copper Corporation, Marcona, Centromin, and Collective Land Ownership Organizations (SAIS). With the exception of IPSS and the Army, most corporate health facilities belong to private, state-owned, or collective enterprises. Although these services are not open to the general public, people covered by specific corporate health programs might have access to IPSS services and to services from public and private health institutions. Although some of these corporate health institutions might have some extension programs that cover a broader group of people, they basically provide medical services to their associates or affiliated workers.

TABLE 2.1: **Peru: National Health System, Institutions and Coverage: 1983-84**

Health Sectors	Hospitals	Health Centers	Sanitary Post	Other	Covered Population (000)	(%)
Public Health Sector	116	463	1405	13	10844.6	56.5
Ministry of Health	109	451	1402	9	10046.6	52.3
Soc. Benefit Public	5	1		1	500.0	2.6
Other Public Institutions	2	7	2	3	48.0	0.3
Local governments		4	1		250.0	1.3
Corporate Sector	98	149	130	0	3190.8	16.6
Social Security	18	67	17		2680.0	14.0
Army and Police	13	54	65		340.0	1.8
State Owned Firms	10	4	7		60.0	0.3
Cooperatives, Agricultural	13	7	16		56.0	0.3
SAIS, Agricultural	1		11		19.8	0.1
Private Firms	43	17	14		35.0	0.2
Other Ministries					25.0	0.1
Private Sector	116	18	3	4	346.9	1.8
Private Institutions	111	9		4	251	1.3
Other Non-Gov. Institutions		6				0.0
Non Profit, Private	5	3	3		23.4	0.1
Private Insurances					72.2	0.4
TOTAL	330	630	1538	17	14382.3	74.9
Total Population					19197.9	100.0
Non-covered					4815.6	25.1

Source: Elaborated from BCR (1984) p.7; ANSSA (1985).

The private health sector includes for-profit and nonprofit institutions and individuals who provide health services to the general public through a price-rationing system. Although the number of private hospitals is similar to the number of hospitals in the public health sector, it is estimated that the private sector serves a relatively small proportion of the population, in contrast to the relatively high segment covered by the corporate and public health institutions.

2.2 Government Expenditures on Health Programs

A large proportion of the expenditures on health in countries like Peru comes from government expenditures on health programs. Furthermore, even though demand or expenditures for health services might be dependent on income, on the supply side, government decisions about provision of health services are influenced mainly by policy decisions on the role of the government in the economy, priorities assigned to social programs, and the financial constraints faced by the public sector. On the demand side, because services are provided free of charge, the main issue becomes the distributive impact of government expenditures on health, that is, distribution of health centers and accessibility of public health services to different social groups.

Table 2.2 shows the evolution of public sector expenditures and the amount of resources assigned to the MOH budget. Data show that total government expenditures as a proportion of GDP increased from 18.6 percent in 1970 to an average of 20 percent between 1975 and 1984. In 1985 the percentage declined to 15.4. In real terms, expenditures throughout the eighties have been significantly higher than expenditures at the beginning of the seventies.

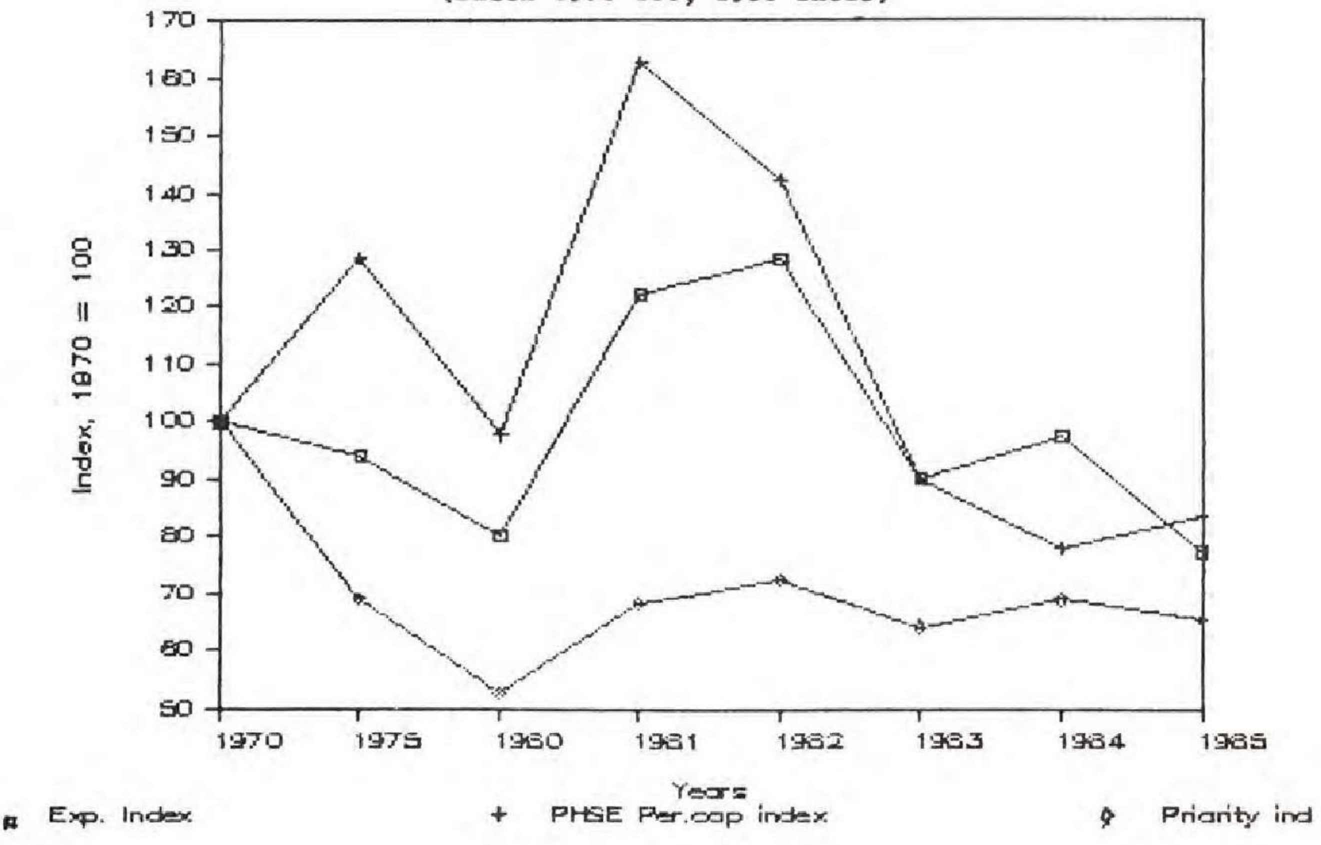
Public expenditures on health show a different pattern evolving. The amount of resources devoted to MOH, as a percentage of the government budget, declined from 6.4 percent in 1970 to around 4.5 percent during the last ten years. As a proportion of GDP, government expenditures on health declined from 1.2 percent during the seventies to 0.6 percent in 1985. Although total government expenditures show a slight increase in relation to that of the seventies, expenditures on health programs in real terms, after significantly increasing during 1980-81, declined approximately 23 percent from the level in 1970.

The evolving pattern of government expenditures on health programs is reflected in the real public health expenditure priority index (see figure p.16). The index increased from a base of 100 in 1970 to 122 in 1981 and 128 in 1982, then declined to 77 in 1985. [4/]

TABLE 2.2: **Peru: Government Revenue and Expenditure in Public Health Programs, 1970-85**

Central Government	1970	1975	1980	1981	1982	1983	1984	1985
Total Expenditure	44.8	110.7	950.9	1859.8	3071.8	5166.5	10728.3	23869.6
Total Govern. Expend/GDP (%)	18.6	20.1	19.1	21.9	21.6	19.5	18.9	15.4
Government Expend (1980 intis)	626.3	854.6	950.9	1122.2	1113.2	879.7	889.0	741.3
Index, 1970 = 100	100.0	136.5	151.8	179.2	177.7	140.5	142.0	118.4
Ministry of Health, Total Expenditure (billion intis)	2.9	4.9	32.1	81.2	141.9	211.8	472.3	995.8
Total Expenditure (million US$)	74.2	108.9	93.9	160.2	143.34	93.3	82.9	91.4
(% of GDP)	1.2	0.9	0.6	1.0	1.0	0.8	0.8	0.6
(% of Total Government Expend.)	6.4	4.4	3.4	4.4	4.6	4.1	4.4	4.2
Gov. PHS Expend. (1980 intis)	40.1	37.8	32.1	49.0	51.4	36.1	39.1	30.9
Index, 1970=100	100.0	94.3	80.0	122.1	128.2	89.9	97.5	77.1
PHS Expend. per capita	3.1	2.6	1.9	2.9	3.0	2.0	2.1	1.6
Per capita index (1970=100)	100.0	82.7	61.7	92.0	94.3	64.3	67.9	52.3
Sector Priority index (base 1970=100)	100.0	69.1	52.7	68.2	72.1	64.0	68.7	65.1

PHS Expenditure Indicators
(Index 1970=100, 1980 intis)



Per capita public expenditures on health, assuming universal coverage, declined from a high of US$9 during 1980-81 to less than US$5 over 1984-85. By excluding those not covered (see Table 3.1) and by assuming a constant coverage rate, per capita expenditures would have been US$12 in 1980-81 and US$6.6 in 1984-85. Excluding the population receiving curative services from corporate and private health institutions and assuming a constant rate of coverage during 1980-85, per capita expenditures on the 52 percent of the population covered by MOH would increase to US$17 for 1980-81 and US$9.6 for 1984-85.

Although data on the proportion of government expenditures on preventative health care is not readily available, such expenditures do not seem to be an important part of the government budget; instead a large proportion of the resources are spent on curative services.

2.3 Public Health Sector: Financing and Expenditure Patterns

The relative importance of government finances in the budget of MOH is presented in Table 2.3. The central government is the main source of MOH financing. During the last two years the central government provided more than 85 percent of the financial resources for MOH. Foreign borrowing was the next source, providing about 7 percent of the funds. Donations and funds from "other" services represented about 3-5 percent of MOH resources. Borrowing from domestic sources and revenues from service fees were minor, representing about 3 percent of the total budget. Aggregate estimates of the sources of financing, based on actual MOH revenues, show that central government financing and MOH revenues represent slightly higher proportions than those contained in the planning budgets; they also show that borrowing figures were usually overestimated. 5/

TABLE 2.3: Peru: Ministry of Health, Sources of Financing, 1984-85 (billions of Soles)

Sources	1984	%	1985	%
Central Government	402.7	85.3	853.2	85.7
Revenues	13.9	2.9	31.9	3.2
Borrowing				
Domestic	0.9	0.2	-	-
Foreign	39.5	8.4	63.2	6.3
Donations	7.4	1.5	13.1	1.3
Others	7.8	1.6	34.4	3.5
TOTAL	472.3	100.0	955.8	100.0

Source: Ministerio de Salud (1985), Table 45.

These data imply that despite the severe reduction in the amount of real resources transferred from the central government, the public health sector has been unable to obtain or use alternative sources of financing, for example, user fees, financing from local governments, contributions from institutional users. Although introducing such alternative sources of financing is difficult in periods of economic recession, these sources might have contributed to sustaining higher revenue levels.

The composition of MOH actual expenditures is presented in Table 2.4. The major change over time is the increase in current expenditures at the expense of capital expenditure accounts. Current expenditures increased from 85 percent in 1980 to around 90 percent in 1982 and 1984.

TABLE 2.4: **Peru: Ministry of Health, Actual Expenditure Patterns, 1980, 1982, 1984 (%)**

Expenditure Items	1980	1982	1984
Current Expenditure	84.1	91.0	89.6
Wages and Salaries	52.5	70.0	69.7
Supplies and Materials	25.1	21.2	16.6
Services	3.1	3.5	3.6
Transfer	14.8	1.6	1.4
Pensions	4.4	3.6	8.7
Capital Expenditure	15.9	8.9	10.4
Research	2.6	3.5	3.3
Constructions	84.8	82.5	56.9
Equipment and Durables	7.5	14.0	39.0
Transfers	5.1	3.4	0.8
TOTAL	100.0	100.0	100.0
(Real terms, millions of intis, 1980)	(49.0)	(61.5)	(58.0)

Source: ANNSA (1985), Tables 4.7.4, 4.7.6, pp. 100,102.

Among the current expenditures, the payroll, including wages, salaries, and pensions, is the most important increasing from 52.5 percent of total expenditures in 1980 to around 70 percent during 1982-84. The more drastically reduced current expenditures are those of supplies and transfers. 6/

Reductions in expenditures on supplies and medicine suggest that the health service provided by this institution is basically medical care. Drugs and materials that are part of the treatment are the responsibility of patient.

2.4 Corporate Health Sector: The Social Security System

The most important corporate health institutions in Peru are IPSS, SAID, the Health Services of the Army and Police, hospital and clinic cooperatives, private health institutions, and decentralized state-owned enterprises.

The social security system in Peru dates back to 1850, when retirement and unemployment pension plans were created for civil servants and army personnel. In 1911 a risk-sharing plan for blue-collar workers was introduced. [7/] The first social security program that covered medical assistance and maternity for blue-collar workers was created in 1936. In 1948 this system was expanded to include government and private-sector white-collar workers, and in 1950 to include army personnel.

During the sixties new social security plans were created that extended coverage to other workers. These offered different types of contributions and benefits, and their funds were administered independently of IPSS. Special pension plans and contribution requirements were created for special interest groups; for example, employees from the executive, legislative, and judiciary branch of the government; other elected representatives; workers from the central bank; foreign service employees; and workers from the decentralized government institutions were all under different contribution and benefit plans. Also, special benefit plans were created for individual groups of blue-collar workers, for example, taxi drivers, stevedores, domestic workers, fishermen, independent and self-employed workers.

A unification of the social security programs began in the early seventies. In 1972 and 1973 retirement and pension plans of all branches of the army and those for the blue- and white-collar workers from the public and private sectors were unified. In 1979 health-care programs and maternity care for blue- and white-collar workers from the public and private sectors were also integrated. 8/

In theory by 1980 all the social security programs, with the exception of the army's, were unified into IPSS. However, despite the efforts at unifying the system, the old differentiation between white-collar and blue-collar health institutions persists. Although important gains have occurred in making medical care and maternity programs uniform, Peru's social security system is still highly stratified, and its coverage is limited. Recent reforms of the current government are directed toward effective unification of the system and toward provision of medical care and other social security programs to all the social groups; however, little progress has been made toward this goal.

Studies on income distribution in Peru show that the social groups covered by the social security system are mainly urban groups who have formal jobs in the modern sector of the economy. They include military personnel, public and private sector white-collar workers, and blue-collar workers from the largest modern-sector firms. They constitute the middle- and high-income groups in the upper quartile of the income distribution. 9/

Data on the budget of the social security system, its proportion of GDP, and the growth of the system's financial resources in real terms are presented in Table 2.5.

TABLE 2.5: **Peru: Social Security System, Total Expenditures, 1961-82 (Millions of intis)**

Year	IPSS Total Budget	Real Terms Index*	% of GDP	Med. & Maternity Expenditure** %	% of GDP
1961	1.7		2.3	N.A.	
1965	3.3		2.5	N.A.	
1970	-	-	-	-	
1975	19.4	100.0	3.1	56.7	2.0
1980	179.3	137.7	3.2	65.2	2.4
1981	337.9	160.6	3.6	66.9	2.7
1982	521.9	140.0	3.4	63.1	2.3

* Index 1975=100.0
** Includes monetary reimbursements.
Source: Elaborated from Cepal (1985) p.332-333, and IMF (1986).

In real terms IPSS's financial resources increased from 19.4 millions in 1975 to 27.2 millions in 1982. The medical care and maternity program was the most important in terms of expenditures absorbing approximately two-thirds of the total resources. During 1980-82 the IPSS budget was more than four times that of MOH. Overall expenditures on maternal and medical assistance programs for this period were around 2.7 times that of the MOH budget (see Table 2.2).

The social security system is financed by contributions from workers, employers, and the government. Workers' contributions are retained from their wages and salaries by their employers who are responsible for paying their own and their workers' social security contributions. The government contributions to the social security system are as an employer and through transfers to the system.

The share of contributions to the social security system by employees, employers, and the government are presented in Table 2.6. In 1983 workers' contributions represented 5 percent of the "basic wages or salaries," employers' shares were 14 percent, and government contributions were 2 percent (as transfers). Independent and self-employed workers' contributions were 15 percent of their reported monthly income (minimum and maximum income levels are established).

By law, all wage-earners or salaried employees from cooperatives and public or private enterprises have to be registered in the social security system. For independent workers, participation in the social security system is optional.

TABLE 2.6: **Peru: Contributions to the Social Security System, by Programs, 1983 (percentage of wages)**

Programs	Employees [a/]	Employers	Government	Self-Employed & Independent	Total [b/]
Pensions	2.5	5.0	1.0	7.5	8.5
Medical & Maternity	2.5	5.0	1.0	7.5	8.5
Professional Risk	-	4.0 [c/]	-	-	4.0
TOTAL	5.0	14.0	2.0	15.0	21.0

a/ Variable rates, with minimum and maximum contributions.
b/ Excluding independent workers.
c/ National average, rates range from 1 to 12.5 percent, depending on type of risk.

Source: From Cepal (1985) p. 328 and SAA (1985) p.56-57.

The medical and maternity programs provide coverage for the spouse, concubine, and children under one year of age. But, even the system's coverage for dependents is limited. Table 2.7 presents gross estimates of the coverage of the medical and maternal assistance social security programs.

Health services to those affiliated with IPSS is provided directly through IPSS's medical posts, clinics, and hospitals, and through contracts for services from private providers. For some groups of white-collar workers there is a "free-option" system by which medical care can be received from private practitioners or clinics. Reimbursement rates for health-related goods and services are established by IPSS.

As in most Latin American countries, health services for military personnel are separated from the rest of the social security system. Within the military, there are separate arrangements for the air force, navy, army, and the police; each has its own private hospitals, medical services, and programs.

TABLE 2.7: **Peru: Coverage of the Social Security System, 1961-83**
(millions)

Year	Total Population	Economically Active Population	IPSS Actives a/	IPSS Total b/	% of Total Population	% of Economically Active Population
1961	10.2	3.3	0.8	0.9	8.8	24.2
1965	11.5	3.7	1.2	1.3	11.3	32.4
1969	12.8	4.2	1.5	1.6	12.5	35.7
1975	15.2	4.9	1.7	2.3	15.3	34.7
1980	17.3	5.6	2.3	2.9	17.3	41.1
1981	17.7	5.8	2.4	3.1	17.4	41.4
1982	18.2	6.0	2.4	3.1	18.1	40.0
1983	18.7	6.2	2.5	3.2	18.7	40.3
1984	19.2	6.4	2.6	3.4	17.7	40.6
1985	19.7	6.8	2.7	5.2	26.3	39.7

a/ 1961-1969 coverage of pension program. Excludes fishermen and jockeys. 1975-1980 coverage of health programs including estimates of army and fishermen. From 1980 on, includes domestic workers, affiliated members (optional) and pensioners.

b/ 1961-1969 includes only spouses of white collar workers with maternity assistance. Since 1975, includes spouses or concubines and children less than one year old with access to the benefits. Inactive 1961-1969 includes white and blue collar workers in pension programs, since 1975 includes workers with professional risk coverage, excluding army, fishermen and jockeys.

Source: Elaborated from Cepal (1985) p.325-326 and INE (1986) pp.33, 66, 138.

The limited number of people served by the social security system in Peru is explained in part by the relatively low proportion of workers engaged in formal wage- or salary-stipulated contracts, by the relatively high cost of the contributions required of independent or self-employed workers who constitute a large segment of the workers in urban areas, and by the large proportion of workers who earn below the stipulated minimum wage used for calculating the minimum legal contributions. Finally, for workers in rural areas who form about 30 percent of the labor force, only workers of large cooperatives and SAID receive regular wages, and most of these cooperatives have their own medical posts or clinics for regular medical assistance. The large proportion of the rural population, however, is out of the scope of the social security system.

Combined data from Table 2.6 on the coverage of the medical assistance and maternity program and data from Table 2.5 on the IPSS budget show that between 1975 and 1982, total expenditures in these programs represented between 2.0 and 2.7 percent of GDP. In real terms, expenditures on these programs increased from about 85 millions in 1975 to nearly 120 millions in 1982. Expenditure per affiliate and dependent members, after a significant increase from US$106 in 1975 to US$136 in 1981, declined to about US$100 in 1982.

Although little is known about expenditures in the other corporate sectors, it is generally perceived that their services are better because members choose the services even when given the option of using the IPSS facilities or public health sector services. The "better" services can be attributed to higher per capita expenditures and to more efficient provision of resources. These hypotheses can be investigated to compare the cost of services among the various corporate health institutions and to identify ways of improving the efficiency of the system. Assuming that per capita expenditures in the other corporate health institutions are similar to that of IPSS, total expenditure of the corporate health sector would be about 15 percent higher than the public health sector, representing about 2.7 percent of GDP.

In summary, people covered by the social security system receive the equivalent of almost five times the medical care received by people in the public health sector programs. Part of the difference might be explained by the inclusion of prescriptions and materials provided by the social security and corporate institutions. Another explanation may be that social security provides a different type of health service than does the public health sector. Hospitals of corporate health institutions, especially those of the social security and the army, are known for having better and less crowded facilities and more modern equipment, which enables them to provide more sophisticated and expensive medical care.

2.5 Private Expenditures on Health-Related Goods and Services

Because services provided by the public and corporate health institutions are free, household expenditures for health-related goods and services could be used to estimate the amount of resources spent on privately produced health goods and services. In this section the results of household surveys are used to provide rough estimates of the magnitude of the private health sector.

The ECIEL (Programa de Estudios Conjuntos pare Integración Económica Latinoamericana) household survey on income and expenditure patterns in metropolitan Lima found that the average share of private expenditures on health-related goods and services, excluding contributions to social security and private medical insurance, represented about 2.2 percent of the household expenditure. Income elasticity of expenditures on health-related services estimated from the ECIEL survey was found to be less than one: 0.55 (Figueroa 1974).

Other findings from the ECIEL survey show an inverse relation between family size and share of expenditures on health-related services. A significantly higher share of health-related expenditures was found in households in which the head of household was more than 65 years old retired. A slightly higher share of health expenditures was found in households in which the head of household was "less educated." Also the survey showed that there was a marked seasonality for expenditure patterns, with higher expenditures during autumn and winter months (May-November), and that the number of children (under six) did not seem to affect health expenditure shares.

The National Household Consumption Survey (ENCA) of 1971-72 showed higher private medical expenditures. For metropolitan Lima, medical expenditures, including prescriptions and materials, represented on average 3.45 percent of the total household expenditure; both the lowest and highest expenditure shares were found in the higher income groups: from 2.52 to 4.50.

The National Multipurpose Household Survey (ENAPRON) of 1977-78 showed that for metropolitan Lima and twelve of the largest cities, the average share of expenditures on health-related goods and services was 2.54 percent of the total reported income. This survey showed the lowest and

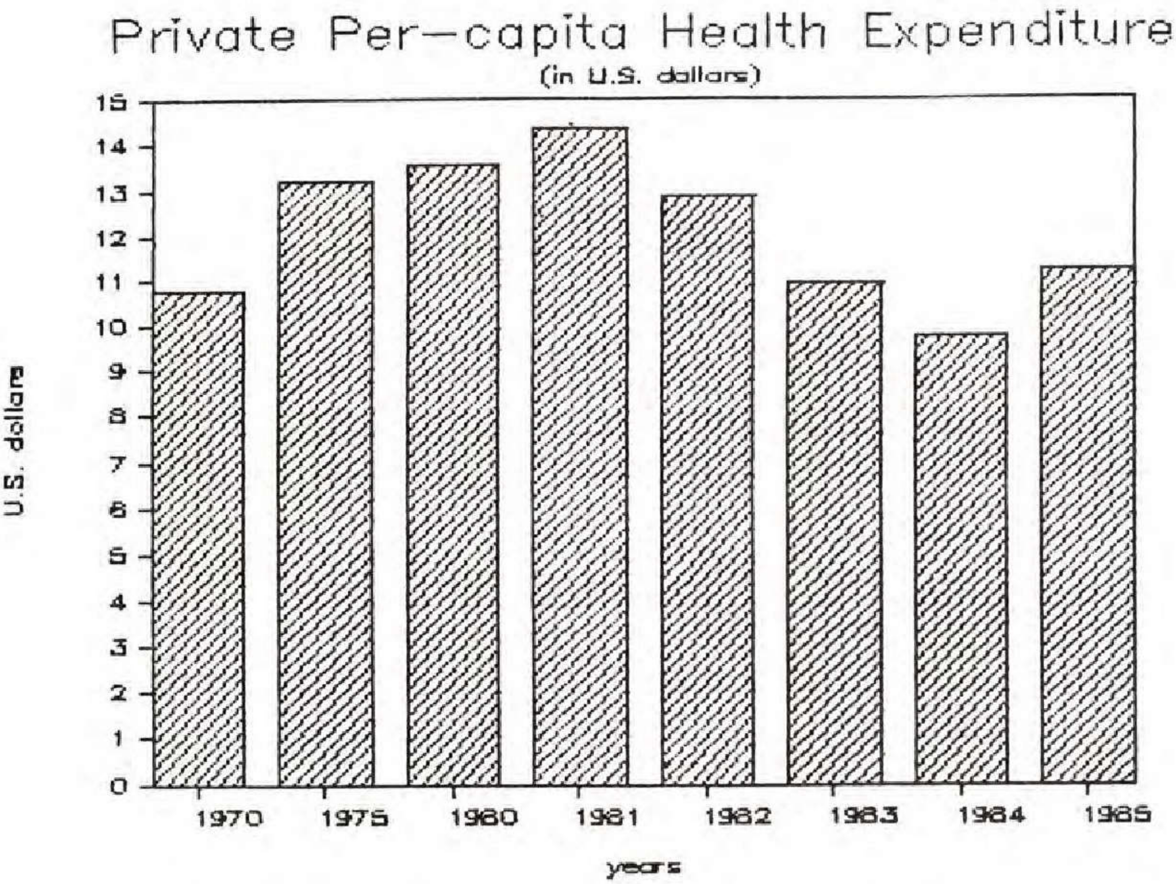
TABLE 2.8: **Peru: Per capita Income and Private Expenditure on Health, 1970-85**
(intis)

	1970	1975	1980	1981	1982	1983	1984	1985
GDP per capita								
(intis 000' real)	262.9	290.9	299.3	301.3	296.4	252.1	256.0	254.2
Index GDP per capita	100.0	110.7	113.9	114.6	112.8	95.9	97.4	96.7
GDP, per capita (US$)	485.9	837.4	875.9	985.1	826.6	651.8	542.3	751.0
Index, 1970=100	100.0	172.3	180.3	202.7	170.1	134.1	111.6	154.6
Private Expenditure in								
Health (per capita)								
Hypothesis A (ENCA) ($)	9.1	9.6	9.8	9.8	9.7	8.9	8.9	8.9
Hypothesis B (ECIEL) ($)	5.8	6.2	6.3	6.3	6.2	5.7	5.7	5.7
Index, 1970=100	100.0	105.9	107.6	108.0	107.0	97.7	98.6	98.2
In US $								
Hypothesis A (ENCA)	16.8	21.0	21.5	22.8	20.9	18.8	17.5	20.0
Hypothesis B (ECIEL)	10.7	15.0	15.5	16.8	14.9	12.8	11.4	14.0
Index, 1970=100	100.0	139.8	144.1	156.5	138.6	118.8	106.4	130.0
Share from Income ($)								
Hypothesis A (ENCA)	3.5	3.3	3.3	3.3	3.3	3.5	3.5	3.5
Hypothesis B (ECIEL)	2.2	2.1	2.1	2.1	2.1	2.3	2.2	2.2

highest expenditure shares to be in the middle-income groups, with expenditure shares ranging from 1.86 to 2.83 percent (see CEPAL 1984).

A survey on economic activities conducted between 1978 and 1979 in eight Andean rural communities in the south of Peru, the poorest region, found that expenditures on health-related services, medicine, and materials represented an average of 2.42 percent of the total monetary exports. 10/

Using data from the ECIEL and ENCA surveys on expenditure shares and income elasticity, changes in total and per capita private expenditures on health between 1970 and 1985 were estimated (see Table 2.8). Expenditure shares and income elasticity were used to estimate average household



Private Per-capita Health Expenditure
(in U.S. dollars)
U.S. dollars
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
1970
1975
1980
1981
1982
1983
1984
1985
years

Income and Health Expenditure
(Per-capita index, 1970=100)
U.S. dollars
90
100
110
120
130
140
150
160
170
180
190
200
210
1970
1975
1980
1981
1982
1983
1984
1985
years
Income
Health Expenditure

expenditure on private health-related goods and services. The results presented under Hypothesis A were derived using the ENCA estimates of average expenditures for 1970; results for the remaining years were derived using the income elasticity value obtained from the ECIEL survey. Estimates based on the ECIEL survey (Hypothesis B) produced the lowest per capita expenditure rates. These can be taken as the low benchmark estimates that show average individual household expenditures on private health-related goods and services. An implicit assumption of these estimates is that no changes in the structure of relative prices in the economy has occurred; that is, the relation between prices of health services and other commodities has remained constant. In general, however, the estimates are rough and thus should be studied with caution. 11/

Data from Table 2.8 show that as per capita income fell from its 1981 peak, private expenditures on health goods and services also declined. In 1985 per capita expenditures in real terms was approximately 2 percent less than expenditures in 1970 and 10 percent less than the highest level, US$22, attained in 1981 (see index 1970 = 100.0). Since 1981 health expenditures have declined continually from between US$17 and US$23 in 1981 to between US$14.0 and US$20.0 in 1985.

Adding expenditures on health-related goods and services and the public, corporate, and household expenditures on private health-related goods and services provides the estimate of the total amount of resources devoted to health.

Table 2.9 summarizes indicators of the relative importance of each of these sectors by coverage and expenditure.

TABLE 2.9: **Peru: Summary Results, Composition of the Health Sector (around 1980-84)**

Sectors	Coverage	Expenditure US$ per capita	Total Expenditure % of the GDP	Sectorial Share (%)
PHS	56.5	10 to 17	0.6 - 0.8	~ 10
CHS	16.6	100 to 130	2.3 3.1	~ 45
PS	?	11 to 20	2.1 - 3.5	~ 45
TOTAL	100.0	55 to 77	5.0 - 7.0	100

Although most policy debates on financing health programs concentrate on financing the public health sector, this sector's expenditures represent only about 10 percent of total health expenditures. Expenditures of the corporate health sector and private households on health-related goods and services represent about 90 percent of total expenditures. These results show a further need to explore the role that the corporate and private sectors could have in implementing health programs.

3. HEALTH INDICATORS: DISTRIBUTION OF MANPOWER AND FACILITIES

3.1 Health Status: Morbidity and Mortality Rates

The main indicators of the health status of the Peruvian population are presented in Table 3.1. This table summarizes the evolving pattern of the mortality, life expectancy, and infant mortality rates from selected years from the fifties to 1986. In 1986 average life expectancy at birth is estimated at 60.8 years, which is below the average life expectancy rate of 61.2 years for other Latin American countries and the average of 71 years for the developed countries (from 1970-75 estimates).

TABLE 3.1: **Peru: Evolution of Health Status Indicators, Selected Periods (per thousand)**

1950-55	1975	1980-85		1986
Crude Birth Rate	47.0	39.4	37.0	35.0
Crude Mortality Rate	21.6	12.2	11.7	9.7
Infant Mortality Rate a/	156.0	106.6	99.0	90.5
Fertility Rate b/		5.6	4.9	4.7
Life Expectancy at Birth	44.1	56.5	58.9	60.8

a/ Live birth, up to one year.
b/ Per woman in child bearing age.

Source: Elaborated from INE (1986, 1986c) and Ministry of Health (1986).

As in most developing countries, the evolution of the life expectancy rate shows that after a significant increase in the life expectancy rate during the fifties and sixties, the rate of increase leveled off during the last decade. Cumulative increases in the life expectancy rates declined from 13 percent between 1960 and 1970 to less than 5 percent during the last ten years (1975-85). For developed countries the life expectancy rate leveled only after it reached 70 years. 12/

Data also show that whereas both birth and mortality rates have been declining, infant mortality remains high, which is the most important factor explaining the relatively low life expectancy and still high crude mortality rates.

Peru's infant mortality rate (infants born alive and living to one year) is about 90 per thousand; it is one of the highest among Latin American countries and is in sharp contrast to the infant mortality rates of the most developed countries, whose rates range from 10 to 20 per thousand. Estimates of the death rate by age group show that, in 1964, about one-third of registered deaths were of infants. More than 50 percent of deaths were children under five years. Table 3.2 presents 1981 estimates of percentages of deaths by age and gender. Comparing these figures with those for 1964 suggests that although important gains have been made in reducing infant mortality, this group still accounts for almost one-fourth of total registered deaths; the under five years age groups account for about 36.5 percent of total registered deaths. 13/

Table 3.2 shows that no major difference exists in the proportion of deaths in each age group by gender. For both male and female groups, more than one-third of deaths are children under five years. The proportion of deaths remains between 4.1 and 4.5 up to the 45-54 years group; thereafter it starts to increase by age.

TABLE 3.2: **Peru: Percentage of Deaths by Age and Sex Groups, 1981**

Age Group	Total	Male	Female
0 to 1	23.2	24.3	22.0
1 to 4	13.3	12.7	14.0
5 to 14	4.1	4.1	4.0
15 to 24	4.5	4.8	4.2
25 to 34	4.3	4.5	4.1
35 to 44	4.5	4.5	4.5
45 to 54	5.5	5.9	5.1
55 to 64	6.8	7.4	6.2
65 to 74	8.8	9.2	8.4
74 and more	17.7	15.1	20.4
Not specified	7.3	7.5	7.1
TOTAL	100.0	100.0	100.0

Source: Elaborated from WHO (1985), Table 13.

Table 3.3 and 3.4 summarize morbidity cases and mortality rates by type of illness for selected periods. 14/

The data for 1980-84 show that per 100,000 people, an average of 803 cases of illness were reported. About one-third of the reported cases were intestinal parasitic diseases. Dysentery, parasitosis, and other infectious diseases, including typhoid fever and typhoid-related diseases, represented more than 50 percent of the reported cases per 100,000 inhabitants. Also, although some improvements have been made in reducing the incidence of tuberculosis, tuberculosis and malaria cases are still high. The pattern in the incidences of malaria shows that from the fifties to the early sixties cases of malaria declined from 209.8 per 100,000 population to 19.3. During the early sixties, reported malaria cases declined to less than 2,000; in 1976 malaria increased to 4,000 cases, and in 1977 to 32,000 cases. At the beginning of the eighties, reported cases declined to 14,000, but in 1983 it again increased to 28,000 and in 1984 the figure was 26,000, averaging 135.9 cases per 100,000 people.

Data in Table 3.3 are reported cases of an illness. Although some of the variation over the various periods can be attributed to early under-reporting of an illness, there are no trends that indicate under-reporting to be the major cause of the differences.

TABLE 3.3: **Peru: Morbidity, Reported Cases by type of Illness Selected Periods and Last Available Year (rate per 100,000)**

Type of Illness	1950-55	1960-65	1970-75	1980-84	1984
Typhoid and Related		52.9	50.2	117.0	86.7
Dysentery		188.3	173.9	37.5	33.3
Infectious Hepatitis		25.8	32.3	31.8	35.9
Parasitosis		100.4	125.1	233.3	234.7
Tuberculosis	213.4	235.4	145.7	137.7	113.1
Malaria	209.8	19.3	66.7	114.2	135.9
Poliomyelitis a/		1.5	0.9	1.7	0.9
Measles (Sarampion) a/		82.9	59.6	72.7	85.0
Diphtheria a/		0.5	0.5	0.9	0.8
Tetanus a/		2.4	2.3	2.3	2.3
Tosferina a/		101.7	83.6	54.0	48.7

a/ Corresponds to 1968-70.

Source: Elaborated from Ministry of Health (1986), Tables 3 to 6.

TABLE 3.4: **Peru: Principal Causes of Death, 1981**

Causes of Death	Total	Male	Female
Infectious and Parasitic Diseases	19.3	19.4	19.1
Tuberculosis	3.9	4.3	3.4
Malignant Neoplasms	6.8	5.9	7.7
Circulatory System	11.9	11.2	12.6
Pneumonia	14.4	13.9	14.9
Bronchitis, Emphysema and Asthma	3.2	3.1	3.3
Digestive System	3.6	3.9	3.2
Perinatal Condition	8.5	9.1	7.8
Injury and Poisoning	6.9	8.1	3.3
Other	21.5	20.9	24.6
TOTAL	100.0	100.0	100.0

Source: Elaborated from WHO (1985), Table 13.

Vaccination programs have not significantly reduced the incidences of diseases such as measles, polio, tetanus, and diptheria. Reported cases of polio, measles, and diptheria per 100,000 persons almost doubled from the 1970-75 period to the 1980-84 period. With the exception of tosferina, dysentery, and hepatitis, the number of cases for all the illnesses that can be controlled by immunization programs almost doubled.

Table 3.4 presents data on causes of death by gender and type of illness. These data are consistent with morbidity patterns presented in Table 3.3. Infectious and parasitic diseases, other intestinal infections, and pneumonia are the main causes of death in both men and women and represent about 42 percent of the total registered deaths.

About 70 percent of these cases are deaths of children under age five years. Pneumonia is the cause of 46 percent of deaths in this age group. Perinatal mortality accounts for 8 percent of total deaths. Table 3.4 shows little difference in mortality patterns by gender. Although there are some minor variations in the number of deaths for each disease, the same group of illness is responsible for about 80 percent of the registered deaths.

The high incidences of infectious parasitic diseases, and other intestinal infections like dysentery, the morbidity and mortality patterns, and the age profiles of morbidity and mortality reveal that infant and child mortality is the most critical health problem in Peru. Most of these types of illnesses are related to lack of sanitation, inadequate waste disposal, and inaccessibility of safe drinking water.

The general goal of a health program is to reduce morbidity and mortality rates. The above patterns suggest that the major causes of morbidity and mortality are environmental-related diseases; therefore, health programs should emphasize preventative measures that address this problem.

This objective requires the allocation of health resources for both preventative and curative services. Available information suggests that concentrating resources on curative services might be inadequate. But without a proper knowledge of the relative costs of preventative and curative services, it is difficult to assess the inadequacies of resource allocation. Further work is needed in this area. 15/

Another issue is the role of the market mechanism in providing the necessary preventative health services that fall within the typical classification of public goods. Although individual efforts can be made to solve the sanitation and environmental problems, an effective solution requires a broader based community effort.

3.2 Coverage and Coverage-Related Indicators

Adequate housing, access to safe drinking water, and appropriate waste disposal are often cited as preconditions for reducing infectious parasitic diseases, which in developing countries like Peru are among the main causes of illness among adults and death in children under five years. Inadequate housing and sanitary conditions adversely affect curative health programs and result in the persistence and spread of communicable diseases.16/ Table 3.5 presents data on the Peruvian population's access to adequate water supply and excretal disposal facilities.

TABLE 3.5: **Peru: Housing and Population by Type of Services, 1981**

Type of Services	TOTAL	Total	Water, Sewer. and Electric.	Water and Sewerage	Water and Electricity	Only Water	Only Electricity	Without Services
TOTAL	3257.1	1659.2	915.6	66.3	153.4	102.8	421.1	1597.9
Percentages	100.0	50.9	28.1	2.0	4.7	3.2	12.9	49.1
Population a/	1775.6	9044.2	4990.7	361.6	836.4	560.2	2295.2	8710.3

Notes a/ Population by type of service has been estimated using the national average of 5.451 persons per house.

Source Elaborated from INE (1986c), p.79.

The data in this table show that only one-half of the total inhabited houses had some type of services: water excretal disposal electricity. The proportion of houses with the three types of services was only 28 percent. The proportion of houses with both water and sewage disposal systems was only 30 percent, while the proportion of population with access to safe drinking water was a little higher, 38 percent. Data on the population living in other housing conditions are not readily available. The figures in Table 3.5 assume a constant number of members per dwelling (the national average of 5.4) and should be taken cautiously. By using the national average, distribution of the population classified as having access to the different types of services will be similar to the distribution of houses.

Limited access to safe drinking water and adequate excretal disposal facilities is more acute in rural areas. Also important disparities exist among the various regions (see Section 3.3).

WHO researchers compiled data for a group of specific preventative and curative primary health services included in the "Health for All by the Year 2000" program. 17/ Coverage was defined as the ratio of population receiving certain types of services to the population in need of these services. 18/ Table 3.6 presents data on the coverage of various health-related services.

One-hundred-percent coverage is one of the goals of WHO's Health for All by the Year 2000 Plan. The above data show several areas in which Peru is still far from these goals. Access to medical services is often measured by the ratio of population to various types of health personnel. Indicators of

TABLE 3.6: **Peru: Coverage and Coverage Related Indicators in Peru**

% Coverage with	
Antenatal Care	59
Attendance of Delivery	43
Child Care	
Vaccination	65
Vaccination with Third Dose	24
Endemic Disease	
AT (?)	37*
Activity to Population Ratio, as %	
Consultations	40
Hospitalization	54

(?) Rough estimate based on partial information.
* Data for years prior to 1978.

Source: Montoya-Aguilar, C. (1985), p.2.

health manpower resources show that Peru is not far from the minimum standards set by WHO. The ratio of population to medical personnel in Peru is about 1300 persons per physician and 2,400 persons per nurse; minimum goals set by WHO are 1,250 per physician and 2,220 per nurse.

The above indicators are not only guidelines for establishing priorities, they are also essential for designing policy objectives and programming optimal allocations of resources among the various health programs according to specific objective functions. These functions, defined as quantitative goals, coverage goals, and estimates of the relative costs of the various preventative and curative health services, are essential for achieving optimal allocation of resources, particularly in a context of limited financial and human resources. 19/ To the extent known, such procedures are not incorporated into the health planning process in Peru; instead, the process involves basic programs, with the general objective of universal coverage and loosely defined quantitative goals.

3.3 Poverty, Coverage, and Regional Disparities

Aggregate average indicators say little about the distribution of personnel and facilities or their availability to different social groups. Table 3.7 presents data showing disparities in the distribution of housing services, hospital beds, and health personnel among the various political departments. Data show that across departments there are large variations in the proportion of houses with different types of services and in the ratios of population to health personnel. In Lima and Callao more than 80 percent of the houses have at least some type of basic service, that is, water, sewer electricity. In the poorest department of the Sierra, the proportion of houses with some of the services ranged from a high of 22 percent in Ayacucho to around 15 percent in Amazonas, Apurimac, Cajamarca, and Puno and 12 percent in Huancavelica.

Regional average ratios of population per medical personnel also vary greatly. Although national averages of population per hospital bed and per physician are 500 and 1,300 respectively, the ratio population/hospital beds is only 200 for Callao and about 300 for Arequipa, Lima, Moquegua, and Tacna. But in the poorest departments, the ratios are at least five times higher for Ayacucho, San Martin, and Apurimac; between five and seven times higher for Huancavelica, Puno, and Amazonas; and more than ten times higher for Cajamarca. A more skewed distribution exists for doctors; while Lima and Callao enjoy an average of about 500 persons per doctor, the ratio increases to almost 18,000 persons per doctor in Ayacucho and Cajamarca, 25,000 persons per doctor in Cajamarca, and more than 31,000 persons per doctor in Huancavelica and Amazonas.

TABLE 3.7: **Peru: Social Security Coverage, Regional Disparities, (thousands)**

Department	Total Population a/	Average Income	Insured b/	(%) Coverage
Lima	4,746	100.0	1,256	26.7
Callao	443	100.0	109	24.6
Ica	434	73.1	89	20.5
Tacna	143	87.0	28	19.6
Arequipa	706	63.6	123	17.4
Lambayeque	674	63.8	101	15.0
Moquegua	101	90.0	14	13.9
Pasco	213	59.1	28	13.1
La Libertad	963	65.0	116	12.0
Ancash	818	54.3	80	9.8
Junin	852	58.5	81	9.5
Tumbes	104	75.9	9	8.6
Loreto	445	70.1	38	8.5
Piura	1,126	65.4	94	8.3
Ucayali	201	66.2	15	7.5
Madre de Dios	33	75.9	2	6.1
San Martin	320	45.9	16	5.0
Cuzco	832	48.6	39	4.7
Huanco	485	50.9	23	4.7
Huancavelica	347	38.6	13	3.7
Puno	890	41.7	33	3.7
Amazonas	255	42.7	8	3.1
Ayacucho	503	40.9	14	2.8
Cajamarca	1,046	39.1	28	2.7
Apurimac	323	40.7	8	2.5
TOTAL	17,005		2,374	14.0

a/ Census enumerated population. Excludes omitted and jungle populations (estimated at 762,226).

b/ Medical attention and maternity programs. Army not included.

c/ Average income of Lima index: Intis 74.88=100.0.

Source: Elaborated from: INE (1983); Cepal (1985), p.327; BCR (1984); BCR (1984), p.44-45.

Because only about one-third of the physicians and about 11 percent of the dentists work through MOH, distribution of health personnel across the country seems to be only marginally determined by MOH allocations. 20/

Measures of inequality in the spatial distribution of health care resources and sanitation services have been estimated and reported in a study of the Central Bank of Peru (BCR 1984). Gini coefficients have been estimated for the distribution of houses with water and houses with sewers, and for the distribution of the population according to health care and sanitation services, Gini coefficients ranged from 0.32 for the distribution of dwellings with water to 0.51 (highest inequality) for the distribution of doctors. Second in inequality was the distribution of dwellings with sewerage (see Appendix Table A.4.1).

Estimates on the coverage of the social security system by departments clearly show a positive correlation between average income of the department and level of coverage; that is, coastal departments with high urbanization and per capita income have the highest coverage. Social security coverage is more limited in departments in the poorest regions of Peru--those south of the Sierra with the larger proportion of the rural population. This is not surprising given the process by which the social security system was created in Peru.

The data on the distribution of services provided by MOH and IPSS show that the number of doctor consultations per capita varied from less than 0.2 in the departments of Amazonas, Apurimac, and Huancavelica to more than 1.5 in Lima, Callao, and Ica. A similar pattern was found in the distribution of the number of per capita dentist consultations. A high correlation (0.82) was found between the number of hospital beds per capita and the number of hospital "egresses." The only variable that had a different pattern was the distribution of health care per capita per health or auxiliary personnel. In general, expensive resources seem to be more concentrated than cheaper ones (doctors versus nurses, and sewerage versus water supply). [21]

A health map of Peru was constructed by choosing a set of variables using a rank correlation coefficient criteria; that is, variables with correlations between 60 and 90 percent were chosen as indicators to organize a ranking of departments according to health status of the population, sanitation, availability of health personnel, extent of coverage of health programs, and accessibility of health services. Of the three groups of departments ranked, the group with the poorest health indicators comprised eight departments from the high mountains (Sierra): Apurimac, Puno, Ayacucho, Cajamarca, Amazonas, Cusco, Huancavelica, and Huanuco. These departments had the highest deficits of health resources and services and the lowest coverage of health programs. They represented about 28 percent of the population and had high illiteracy rates. They were also predominantly agricultural economies, with incomes well below the national average and high migration rates. The group with the highest health indicators and the highest coverage of health programs and availability of health facilities were the rich coastal departments of La Libertad, Arequipa, Lambayeque, Lima, Callao, Ica, Tacna, and Moquegua. The BCR study found that the distribution of health resources across the various regions of the country had a pattern similar to the distribution of productive activities. The study also stated that some improvements in coverage could be obtained by eliminating access barriers to some of the facilities of corporate health institutions.

Indicators of distribution patterns of health resources, particularly of health personnel and health facilities, still have several shortcomings. They hide an important source of inequality derived from the method of calculation, which assumes that all resources, including those with restricted access, are available to the general public. In addition, it is assumed that needs or incidences of illness are uniformly distributed across regions and among the population groups and that existing facilities or resources correspond to population needs.

Some of these issues have been addressed in data from the 1984 National Health and Nutrition Survey (ENNSA) and in studies by the National Health Sector Analysis Group (ANSSA), and ad hoc research groups formed to analyze the data from this survey. 22/ The results from ENNSA reported by the National Institute for Statistics (INE) (1986) show that the proportion of the population involved in accidents or having symptoms of disease was inversely related to level of income and education. A larger proportion of the poor and lower educated population reported having symptoms of illness. As the level of education and income increases, the proportion of the population with symptoms of illness or accidents declines.

The proportion of the population with symptoms of diseases seeking professional medical attention was positively related to both education and income. Demand for traditional healers and auxiliary health personnel (lower level health personnel) was inversely related to income levels.

ENNSA results on the prevalence and types of diseases and the distribution of population with symptoms seeking health care by age groups are consistent with morbidity and mortality patterns presented in Section 3.1. There are high incidences of parasitic infections and respiratory diseases. Although the prevalence of symptoms was relatively evenly distributed across political and ecological regions and rural and urban areas, distribution of population with symptoms seeking medical attention was higher in coastal regions and urban areas. The unconditional probability of seeking some type of medical care ranged from 15 percent in Lima to less than 5 percent in the rural mountains of Sierra (see Table 3.7).

4. SUMMARY AND CONCLUSIONS

To analyze the financing of the health sector, Peruvian health institutions were classified into three groups: (1) the public health sector, which provides free services to the general public; (2) the corporate health sector, which restricts services to affiliated members; and (3) the private health sector, which provides services through explicit price-rationing schemes.

The central government is the main source of financing for the Ministry of Health (MOH), the main institution of the public health sector. The resources devoted to MOH as a percentage of the government budget declined from 6.4 percent in 1970 to around 4.5 during the last ten years. As a proportion of GDP, government expenditure in health declined from 1.2 percent during the seventies to 0.6 in 1985. Per capita public expenditure on health declined from a high of US$9.0 during 1980-81 to less than US$5 during the last two years.

The data presented in this paper (Table 2.8) show that while coverage by the public health sector is relatively high, the proportion of financial resources represents only 10 percent of the total resources spent in health-related goods and services. Expenditures of the corporate and private health sectors represent about 90 percent of total sectorial expenditures. This result calls for further studies to explore the roles that the corporate and private sectors can play in implementing health programs.

While mortality rate has been declining infant mortaly rate remains high: around 90 per thousand (compare with between 10 to 20 per thousand in developed nations). Infections parasitic diseases, pneumonia, and other environmental related diseases appear as the main causes of morbility and mortality rates. With the exception of tosferina (whooping cough) incidence of illness that can be controlled by immunization programs almost double.

Prevalence of environmental related diseases and high incidence of illness that could be prevented by vaccination suggest that concentration of Peruvian health institutions in the production of curative services rather than in preventive actions might be indicating a gross misallocation of resources spent in health. It also implies that there is a limited scope of the market mechanisms in alleviating the major causes of observed morbidity and mortality patterns. Further analysis of these issues is needed.

Health related indicators also show that there is a high degree of inequality in the spatial distribution of health physical facilities, health personnel and sanitation services. Furthermore, there seen to be a higher degree of concentration of relatively more expensive resources.

TABLE A.2.1: **Peru: Ministry of Health, Actual Revenues by Sources, 1980-84 (%)**

Sources	1980	1981	1982	1983	1984
Central Government	88.9	90.7	88.5	88.2	86.7
Revenues	6.7	6.2	8.2	7.1	7.2
Borrowing	4.0	2.8	1.5	2.8	4.6
Transfers	0.3	0.2	1.8	1.9	1.5
TOTAL	100.0	100.0	100.0	100.0	100.0
Actual budget (billions of soles:					
Current	49.0	83.2	166.3	341.5	725.6
Constant, 1980)	49.0	50.7	61.5	58.1	58.0

Source: ANNSA (1985), pp.96-97.

TABLE A.2.2: **Peru: IPSS, Covered Population: Active and Dependents, 1980-85 (thousands)**

Covered Population	1980	1981	1982	1983	1984	1985
Active a/	2272.2	2373.9	2390.0	2497.6	2611.0	5242.5
Dependent						
Spouses	620.0	649.5	676.9	705.3	734.5	765.2
Children	45.2	47.2	49.2	51.2	53.2	1761.9

a/ Active members: white collar, blue collar, domestic workers, affiliated members and pensioners.

Source: INE (1986), p.66.

TABLE A.3.1: **Peru: Measures Related to Equity in Health Care, 1982**
Health Care Resources and Sanitation Services
(%)

Department	Population	Resources: Doctors	Resources: Nurses	Resources: Hospital Beds	Dwellings: Total	Dwellings: With Water	Dwellings: With Sewerage
Amazonas	1.5	0.0	0.1	0.3	2.4	0.6	0.4
Ancash	4.8	1.2	3.4	2.7	5.1	4.5	3.7
Apurimac	1.9	0.1	0.5	0.7	2.2	0.5	0.2
Arequipa	4.2	5.3	8.2	6.8	4.3	5.7	6.0
Ayacucho	2.9	0.2	1.3	0.9	2.6	1.5	0.7
Cajamarca	6.1	0.5	0.6	0.9	6.3	2.0	1.4
Callao	2.7	6.3	4.5	4.9	2.3	4.4	5.3
Cuzco	4.9	1.0	2.2	2.9	5.4	2.6	2.1
Huancavelica	2.0	0.1	0.4	0.7	2.4	0.6	0.4
Huanuco	2.8	0.6	0.6	1.5	2.9	1.0	0.9
Ica	2.5	2.8	3.8	3.7	2.5	3.1	2.4
Junin	5.0	1.5	4.0	4.5	5.3	4.3	3.1
La Libertad	5.6	4.9	5.5	4.9	5.5	6.5	6.1
Lambayeque	4.0	2.6	5.4	3.8	3.5	4.5	4.3
Lima	28.1	66.6	50.7	48.4	26.4	45.1	52.8
Loreto	2.6	0.8	0.7	1.5	2.2	2.0	1.8
Madre de Dios	0.2	0.1	0.1	0.2	0.2	0.0	0.1
Moquegua	0.6	0.7	0.2	1.1	0.2	0.7	0.7
Pasco	1.2	0.6	1.2	1.7	1.3	0.8	0.6
Piura	6.6	2.3	2.7	3.2	6.1	5.2	4.2
Puno	5.2	0.5	1.5	1.6	6.4	1.5	0.8
San Martin	1.9	0.2	0.5	0.8	1.7	0.9	0.3
Tacna	0.9	0.6	1.3	1.4	0.9	1.5	1.4
Tumbes	0.6	0.2	0.3	0.3	0.5	0.1	0.1
Ucayali	1.2	0.3	0.3	0.6	1.0	0.4	0.3
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Gini Coefficient of Inequality	-	0.51	0.38	0.34	-	0.32	0.41

Source: Banco Central de Reserva del Perú, Mapa de Salud del Perú, Lima: December 1984. Graphs 1-5, pp.19, 20, 23, 24 and 29, from Musgrove, P. (1986).

TABLE A.3.2: **Peru: Measures Related to Equity in Health Care, 1984: Morbidity and Medical Attention**

Department	Prevalance (%) of Symptoms				Percent Seeking Medical Attention			
					Given Presence of Symptoms			
	All Kinds	Respiratory Disease	Parasite Infection	In Total	All Ages	I Year	1-4 Yrs.	5 Yrs.
Coast 34.89	16.11	0.21	12.67	30.86	51.41	30.68	28.64	
Urban 34.87	16.34	0.20	13.36	31.54	55.74	32.69	29.96	
Lima 36.57	17.68	0.15	14.88	33.49	59.43	35.87	31.62	
Slums	37.32	16.85	0.19	14.14	32.05	64.84	32.85	29.78
Rural 35.00	14.38	0.28	7.50	18.76	27.14	16.52	18.71	
Mountains	30.05	11.95	0.16	5.53	15.89	24.13	15.47	15.49
Urban 21.50	9.88	0.11	7.38	28.20	41.33	25.63	28.09	
Rural 33.75	12.84	0.18	4.73	12.49	19.32	12.33	12.10	
Jungle 36.03	12.06	1.78	7.65	18.39	27.33	17.20	17.94	
Urban 33.72	11.59	1.36	10.36	25.59	42.63	22.34	24.97	
Rural 37.35	12.32	2.02	6.11	14.69	18.42	14.46	14.41	
National Total	33.31	14.20	0.36	9.60	24.18	38.89	23.83	23.35
Urban 32.51	14.93	0.26	12.15	30.77	52.64	30.90	29.46	
Rural 34.62	13.01	0.53	5.45	14.01	20.55	13.51	13.69	

Source: Encuesta Nacional de Nutrición y Salud (National Health and Nutrition Survey), Peru, 1984. Tables 2.1, 2.2, 2.2A and 2.13 produced by the Instituto Nacional de Estadística, September 1985, unpublished, from Musgrove, P. (1986).

TABLE A.4.1: **Peru: Regional Disparities, selected Health Indicators, 1981**
(%)

Department	Percentage of Houses with Type of Services								Persons Per House	Thousand of People Per			
	TOTAL	Total	Water, Sewer. & Elec.	Water and Sewer.	Water and Elec.	Only Water	Only Elec.	Without Services		Hospi-tal Bed	Physi-cian	Nurse	Dentist
Amazonas	100.0	17.8	5.0	1.9	2.0	6.8	2.1	82.2	5.7	2.2	25.0	24.7	10.2
Ancash	100.0	38.7	24.9	6.7	1.0	0.7	5.4	61.3	5.2	0.7	5.2	3.5	21.7
Apurimac	100.0	17.4	2.3	1.0	5.5	6.6	1.9	82.6	4.8	1.6	31.3	11.1	29.4
Arequipa	100.0	68.7	36.0	2.9	8.8	2.3	18.6	31.3	5.4	0.3	1.0	1.3	3.6
Ayacucho	100.0	23.0	4.9	0.6	1.7	5.3	10.5	77.0	4.6	1.5	17.9	5.8	25.0
Cajamarca	100.0	15.8	7.0	3.2	0.2	0.2	5.2	84.2	5.4	3.3	17.9	27.8	29.4
Callao	100.0	90.3	64.4	1.2	4.9	1.0	18.9	9.7	5.9	0.2	0.5	1.4	2.0
Cuzco	100.0	27.3	9.7	1.0	3.4	4.1	9.2	72.7	5.0	0.8	6.0	5.6	7.6
Huancavelica	100.0	12.5	2.6	0.7	4.0	2.6	2.6	87.5	4.6	1.7	31.3	11.7	35.7
Huanuco	100.0	18.4	6.4	3.2	0.8	1.6	6.4	81.6	5.4	1.2	5.7	11.7	16.1
Ica	100.0	65.6	28.3	1.5	11.6	8.0	16.1	34.4	5.7	0.4	1.1	3.0	2.2
Junin	100.0	49.5	16.0	1.5	4.1	5.2	22.7	50.5	5.2	0.6	4.0	2.6	7.9
La Libertad	100.0	52.8	28.4	3.4	7.2	6.1	7.5	47.2	5.5	0.6	1.5	1.8	7.1
Lambayeque	100.0	59.2	31.9	3.1	6.9	6.1	11.3	40.8	6.2	0.5	1.9	1.4	6.7
Lima	100.0	85.2	56.4	1.3	5.5	1.7	20.4	14.8	5.7	0.3	0.5	1.4	2.0
Loreto	100.0	41.5	20.8	0.9	7.9	2.8	9.1	58.5	6.9	0.4	3.7	9.3	6.8
Madre de Dios	100.0	34.0	5.6	0.4	5.9	0.5	21.5	66.0	6.9	0.7	3.7	4.5	11.1
Moquegua	100.0	62.3	31.8	0.6	5.2	1.7	23.0	37.7	4.8	0.3	1.1	5.6	3.2
Pasco	100.0	46.5	12.0	0.7	7.6	4.1	22.1	53.5	5.5	0.4	2.7	2.6	9.3
Piura	100.0	37.8	17.8	2.2	5.3	7.6	4.9	62.2	5.9	1.0	3.7	6.0	11.6
Puno	100.0	14.8	7.6	2.6	0.4	0.7	3.5	85.2	4.4	1.9	12.5	8.5	50.0
San Martin	100.0	36.2	5.7	0.6	13.9	2.8	13.1	63.8	6.0	1.5	10.4	8.9	15.2
Tacna	100.0	77.3	46.7	1.9	10.0	7.0	11.6	22.7	5.3	0.3	1.8	1.7	4.5
Tumbes	100.0	86.6	7.3	0.4	2.6	0.6	75.7	13.4	6.4	0.9	5.4	4.9	6.7
Ucayali	100.0	27.4	5.3	0.3	4.8	1.1	16.0	72.6	6.7	1.0	6.6	8.2	13.5
TOTAL	100.0	50.9	28.1	2.0	4.7	3.2	12.9	49.1	5.5	0.5	1.3	2.4	4.3

Source: Elaborated from census data reported in INE (1986c), p.79; INE (1986), p.24, 31 and Ministry of Health (1985), Table 7.

NOTES

1. Figures refer to actual expenditure from January to October 1984 and 1985, see INE (1986) p. 32.

2. See Ministry of Health (1985) p. 3-10, 33-35.

3. These estimates should be taken cautiously. I have taken the distribution of population from ANSSA (1985). Distribution of institutions does not necessarily follow the same criteria. Data refer to coverage of a population by particular health group or institution. No detailed explanation of methodology used for the estimation is presented. For the private health group, coverage seems to refer to those having access to formal private institutions; it does not consider those receiving medical attention from private doctors, auxiliary health personnel, and traditional healers.

4. This priority index is defined as the ratio of total government expenditures to government expenditures on health programs. The index is independent of whether expenditures are increasing or declining; it only measures whether expenditures on health programs have been reduced or have increased proportionately to total government expenditures. (See Suarez 1985.)

5. ANSSA (1986) reported that during 1980-84 central government resources and MOH revenues represented approximately 88 and 7 percent respectively. Borrowing was between 1.5 and 4.6 percent and transfers between 0.2 and 1.8 percent (see Table 4.7.1, p. 96).

6. Transfers seem now to be considered within the general budget as a result of the integration of some decentralized health institutions to which these transfers were made.

7. In 1934 stevedore workers from Callao, Peru's main seaport, and jockeys were incorporated into the existing retirement and pension programs.

8. For a detailed description of the evolution of the social security system in Latin American countries and Peru see Cepal (1985), Messa-Lago (1981), and Roemer (1975).

9. See studies from Webb (1977) and Figueroa and Webb (1977).

10. The 2.4 percent share has been estimated by using as weights the share of medical expenditure of each of the eight communities and by corresponding share of the value of the monetary exports. Data has been taken from Figueroa (1983), Tables 3.4 and 3.5, pp. 63-65. Import shares ranged from 0.3 to 6.6 percent.

11. Although existing information shows the possibility of presenting more detailed calculations, they are out of the scope of the present paper.

12. For a summary of health status indicators of the various countries and regions of the world see World Bank (1980).

13. A recent report from MOH presents estimates that the under five years age groups accounted for more than 45 percent of total deaths. But no specific data on deaths by age group is presented. See Ministerio de Salud (1986), p. 3.

14. Data needed to evaluate health status of the population and efficiency of the medical care systems should combine age groups and morbidity and mortality rates; regrettably such statistics are not readily available. For Peru, knowledge of incidence of illness is based on cases of illness reported to health personnel and is reported in MOH annual reports. A detailed collection of data on causes of deaths by type of illness, gender, and age group is compiled by WHO.

15. A preliminary discussion of this issue in terms of cost per preventative and curative health service is presented by Musgrove (1986).

16. For references and discussions on the relation between access to drinkable water and sanitation facilities and improvements in health, see World Bank (1970), pp. 23-27.

17. See PAHO (1982).

18. A discussion of definitions and issues related to defining and selecting health coverage indicators is contained in a collection of yet unpublished articles from Montoya Aguilar and Marin-Lira from WHO. I would like to thank the first author for providing the material presented here.

19. This observation is derived from the analysis of the Ministry of Health Plan 1985-86, and from the way such plans have been conducted in the past. For a summary of the planning process see OIH (1977), p. 82-96.

20. BCR study estimates that in 1980 only 26.9 percent of doctors and nurses and 11.3 percent of dentists were employees; the rest were working for the corporate and private health sector (see BCR [1984], p. 30). Concentration of health personnel in urban areas and in coastal cities can be thought of as the result of optimal market allocations. Given the patterns of distribution of income and wealth, allocation of MOH resources seems to have done little in altering spatial distribution patterns.

21. This is one of the conclusions from Musgrove's interpretation of BCR data. See Musgrove (1986), p. 5. Data are presented in Table A.IV.2.

22. A description of the organizational and methodological aspects of the survey can be found in Musgrove (1985) and in INE (1986).

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Measuring the Willingness to Pay for Social Services in Developing Countries

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Measuring the Willingness to Pay for Social Services in Developing Countries

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Number 45

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ABSTRACT

We provide a methodology for the ex ante evaluation of the welfare effects of proposals to use user fees to finance improved access to social services in developing countries. The analysis requires estimation of demand functions, from which price elasticities and the willingness to pay for improved access can be obtained. The willingness to pay is the maximum price that can be charged without reducing individuals' welfare and utilization of medical services. The estimation is complicated by the problem that governments in developing countries often are the dominant suppliers of social services in their countries, and provide these services free of charge so that there is little price variation in the data. We show how variation in individuals' private time prices can be used to identify all of the parameters of the demand functions.

The methodology is used to evaluate the possible implementation of the user fee plan for medical care clinics in rural Côte d'Ivoire. Our results show that it is likely to have highly regressive welfare effects. Specifically, the policy is shown to increase the welfare and medical care utilization of individuals in the top half of the income distribution, while reducing the welfare and medical care utilization of individuals in the bottom half of the income distribution.

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I. INTRODUCTION

Providing access to social services such as medical care and education is a top priority for many developing countries. Indeed, over the last twenty-five years public medical care centers and schools have proliferated throughout the developing world. These facilities typically charge little or nothing for their services, and tend to be concentrated in urban areas so that rural dwellers must often travel long distances to avail themselves of the services.[1] A large scale expansion of social services to the rural areas is complicated by the current financial crisis in the developing world. Governments faced with huge foreign debt and large fiscal deficits are reluctant, and in many cases unable, to further bloat their budgets by opening new (free) social service programs.

An increasingly popular proposal is to finance social services through user fees (access charges). These fees are a means of recovering some and possibly all of the variable costs of operating facilities, and, if they are set at marginal cost, are likely to improve allocative efficiency. Thus, user fees may allow governments to expand social services to rural areas without adding a permanent increase to their annual budgets.[2]

Any implementation of the user fee plan requires an *ex ante* evaluation of the welfare consequences. This, in turn, requires knowledge of the properties of the demand function, especially price elasticities and the effects of other non-monetary costs such as travel time. The price elasticities provide information about how user fees will affect utilization and revenues. Travel time effects can be used to measure the amount individuals are willing to pay for improved access (reduced travel time). If governments open new social service facilities in rural areas, then the willingness-to-pay is the maximum price that can be charged without making individuals worse off.

The usually straight-forward exercise of demand estimation is greatly complicated in developing countries by the fact that there is little or no price variation within a country. In many developing countries the vast majority of social services are run by the government who set prices close, and in many cases equal, to zero. Even when prices are positive, they are typically small and uniform within the country. A second issue in modeling the demand for social services is that the decision to use them is discrete. For example, in the case of medical care, individuals choose whether to obtain care from a clinic, hospital, private doctor or to treat themselves.

We derive a discrete choice specification of the demand for medical care from a theoretical model in which private time price variation can be used to identify the parameters necessary to compute monetary price elasticities and willingness-to-pay measures (compensating variations). The model makes use of the well known result that private prices such as the opportunity cost time ration the market when monetary prices are absent or small (Becker, 1965).[3] An added advantage of the model is that it is flexible enough to allow the price elasticities and willingness-to-pay measures to vary by income levels, so that the distributional welfare effects of user fees can also be examined. Moreover, the model is easily adaptable to other social service markets such as education and family planning.

Most studies of the demand for medical care in developing countries have found little impact of prices on demand. These studies typically model demand as a discrete choice with the price effect specified to be independent of income.[4] This assumption is extremely restrictive, since one would expect the wealthy to be less sensitive to price differences among providers than the poor. Gertler, Locay, and Sanderson (1987) show that these models are inconsistent with utility maximization, and derive a discrete choice specification from a theoretical model that implies a natural interaction between price and income in the demand functions. They find, for the case of Peru, that prices are important determinants of medical care demand and that demand indeed becomes more elastic as income falls.

The studies mentioned above specify time prices as non-monetary nuisance parameters in the utility function, implying that their coefficients reflect the marginal disutility of traveling. Becker (1965) points out that time prices should enter via the budget constraint. Dor, Gertler, and van der Gaag (1987) extend Gertler, Locay, and Sanderson by including time prices in the budget constraint to estimate travel time elasticities. We show that variation in travel time is sufficient to identify all of the parameters necessary to compute monetary price elasticities and compensating variations.

We use this model to evaluate the potential welfare effects of employing user fees to finance an expansion of medical care facilities in rural Cote d'Ivoire. This area is an especially appropriate region for such analysis as income levels are extremely low and the only available medical care is is from sparsely-located free government facilities. Our results show that the policy would be highly regressive. Specifically, it would increase the welfare and medical care utilization of individuals in the top half of the income distribution, but reduce the welfare and medical care utilization of individuals in the bottom half of the income distribution.

II. A MODEL OF THE DEMAND FOR MEDICAL CARE

Our framework is a model in which utility depends on health and on the consumption of goods other than medical care. If an illness or accident is experienced, individuals must decide whether or not to seek medical care. The benefit from consuming medical care is an improvement in health, and the cost of medical care is a reduction in the consumption of other goods.

Individuals have to decide not only whether to seek care, but also what type of care. They are able to choose from a finite set of alternative providers one of which is self-treatment. Each provider offers an expected improvement in health (efficacy) for a price. Let us define the quality of an alternative provider as the expected improvement in health as a result of that provider's medical care. The price of an alternative includes both monetary outlays and private access costs such as the opportunity cost of travel time. Based on this information and their incomes, individuals choose the alternative that yields the highest utility.

Formally, let the expected utility conditional on receiving care from provider j, be given by

$$U_j = U(H_j, C_j) \tag{1}$$

where H_j is expected health status after receiving treatment from provider j, and C_j is consumption net of the cost of obtaining care from provider j.

The medical care purchased from provider j is invested in health. The quality of provider j's medical care is defined as the expected improvement in health over the health that an individual would expect if he or she treated him or herself. In essence, quality is an expected marginal product. Let H_0

be expected health status without professional medical care (i.e. self-treatment). Then, the quality of provider j's care is $Q_j = H_j - H_0$, which yields an expected health care production function of the form

$$H_j = Q_j + H_0. \tag{2}$$

Quality, as specified, varies by provider, but it may also vary by individual characteristics such as health status and education.

The health production function assumes a simple form for the self-care alternative. Since $H_j = H_0$, we have $Q_0 = 0$. This implicitly normalizes the health care production function so that the quality of a particular provider's care is measured relative to the efficacy of self-care.

Consumption expenditures (net of medical care) are derived from the budget constraint. The total price of medical care includes both the direct payment to the provider and the indirect cost of access (e.g. the opportunity cost of travel time). Let P_j^* be the total price of provider j's care and Y be income, so that the budget constraint is

$$C_j + P_j^* = Y, \tag{3}$$

with $C_j \geq 0$ required for the jth alternative to be feasible. Substitution of (3) into (1) for C_j yields the conditional indirect utility function

$$U_j = U(H_j, Y - P_j^*).$$

Notice that income affects utility through the consumption term, and that the price of medical care is foregone consumption.[5]

We are now ready to specify the utility maximization problem. Suppose the individual has J+1 feasible alternatives (with the j=0 alternative being self-care). The unconditional utility maximization problem is

$$U^* = \max(U_0,\ U_1, \ldots, U_J), \tag{4}$$

where U^* is maximum utility.

III. EMPIRICAL SPECIFICATION

The solution to (4) yields a system of demand functions, whose forms are probabilities that the alternatives are chosen. The probability that a particular alternative is chosen equals the probability that this choice yields the highest utility among all the alternatives. Thus, the functional form of the demand functions depends on the functional form of the conditional utility function and the distribution of the stochastic variables.

The Conditional Utility Function

Gertler, Locay and Sanderson (1987) show that income can influence the choice of provider only if the conditional utility function allows for a non-constant marginal rate of substitution of health for consumption. A parsimonious functional form that does not impose a constant marginal rate of substitution is the semi-quadratic, which is linear in health and quadratic in consumption. Specifically, let the conditional utility function be

$$U_j = \alpha_0 H_j + \alpha_1 C_j + \alpha_2 C_j^2 + \epsilon_j \qquad (5)$$

where ϵ_j is a zero mean random taste disturbance with finite variance and is uncorrelated across individuals and alternatives.

Consumption (net of the cost of obtaining care from provider j) is derived from the budget constraint in (3). Specifically $C_j = Y - P_j^*$. The full price of medical care is the direct payment to the provider plus the value of time spent in obtaining the care. Consumption, then, is

$$C_j = Y - P_j - wT_j \qquad (6)$$

where P_j is the direct payment to provider j, w is the opportunity cost of time, and T_j is the time spent obtaining care from provider j.

Substitution of (6) into (5) yields

$$U_j = \alpha_0 H_j + \alpha_1(Y - P_j - wT_j) + \alpha_2(Y - P_j - wT_j)^2 + \epsilon_j \qquad (7)$$

Since $P_0 = T_0 = 0$, the conditional utility function in (7) reduces to

$$U_0 = \alpha_0 H_0 + \alpha_1 Y + \alpha_2 Y^2 + \epsilon_0 \qquad (8)$$

for the self-care alternative.

The identification of the parameters in (7) requires that the values of expected health and consumption differ across the alternatives. The alternative chosen is the one that yields the highest utility. Therefore, if the contribution of either expected health or consumption to utility is constant across alternatives they cannot influence which alternative is chosen.

If we had assumed a linear utility function, which imposes a constant marginal rate of substitution, the third term on the right-hand side of (7) would not be present. The contribution of income to utility would then reduce to $\alpha_1 Y$, which is constant across alternatives. Since only differences in utility matter, income would not be allowed to influence which alternative is chosen. The second order consumption term implicitly includes a price-income interaction whose value is not constant across alternatives, and therefore is not differenced out of the model. This price-income interaction allows price effects to vary by income.[6]

At this point it is easy to show that all of the parameters can still be identified if monetary prices are zero. The identification of α_1 and α_2 in

(9) requires variation in prices and/or travel time across alternatives so that the contribution of consumption varies across alternatives. Hence, it is obvious that it is sufficient to have variation in T_j across alternatives.

Quality

The remaining issue in the specification of the conditional utility function is the measurement of the expected efficacy (quality) of each alternative. Substitution of the health production function (2) into the conditional utility function (7) yields

$$U_j = \alpha_0 H_j + \alpha_0 Q_j + \alpha_1(Y - P_j - wT_j) + \alpha_2(Y - P_j - wT_j)^2 + \epsilon_j. \tag{9}$$

Since $Q_0 = 0$, the conditional utility function in (8) for the self-care alternative reduces to

$$U_0 = \alpha_0 H_0 + \alpha_1 Y + \alpha_2 Y^2 + \epsilon_0. \tag{10}$$

The $\alpha_0 H_0$ term appears in all the conditional utility functions, and its value is constant across alternatives. Since only differences in utility matter, these terms can be ignored.

In the non-self-care conditional utility functions in (9), quality is unobserved. We solve this problem by letting Q_j be a parametric function of its observable determinants. The expected quality of provider j's care is the expected improvement in health (marginal product) over the expected level of health that would occur from self-treatment. The expected improvement in health can be viewed as being produced through a household production function. The arguments of the household production function are provider characteristics, and individual characteristics such as health status and ability to implement the recommended treatment plan. For example, the expected improvement in health from hospital care relative to self-care may be increasing in education, since individuals with higher education may be better able to implement recommended treatment plans.

The marginal utility of an individual's health may vary by family. For example, the marginal utility of the health of a child may depend on how many children there are in the household. In general, the value of health may vary with many demographic variables such as age, sex, education, and family composition.

The basic determinants of both the quality household production function and the marginal utility of quality are demographic variables. Pollak and Wachter (1975) argue that the separate effects of demographic variables in the household production function and in the marginal utility of quality cannot be identified. We therefore, specify a reduced form model of the utility from quality. Formally, let the utility from quality be given by

$$\alpha_0 Q_j = \beta_{0j} + \beta_{1j} X + \eta_j, \tag{11}$$

where X is a vector of demographic variables and η_j is a zero mean random disturbance with finite variance.

To make the specification as general as possible, we let the coefficients in (11) vary by alternative. Allowing for different intercepts permits the baseline quality to vary by alternative, and having different slope coefficients allows the provider's productivity relative to self-care to vary with individual characteristics such as age, education, and severity of illness.

The random disturbance captures unmeasured portions of the quality function such as severity of illness. These disturbances may be correlated across alternatives.

Since $Q_0 = 0$, the utility from quality simplifies to $\alpha_0 Q_0 = 0$ for the self-care alternative. Hence, the coefficients in (11) are interpreted relative to the self-care alternative. Notice further that the normalization sets the unobserved portion of quality in the self-care alternative, η_0, to zero.

Substitution of (11) into the conditional utility functions in (9) yields

$$U_j = V_j + \eta_j + \epsilon_j, \qquad (12)$$

where

$$V_j = \beta_{0j} + \beta_{1j} X + \alpha_1 (Y - P_j - wT_j) + \alpha_2 (Y - P_j - wT_j)^2 \qquad (13)$$

Notice that the intercept and coefficients on the demographic variables vary by alternative, whereas the coefficients on the economic variables are constant across alternatives. Further, the disturbances in the non-self-care conditional utility functions are correlated with each other but are uncorrelated with the disturbance in the self-care conditional utility function.

The Demand Functions and Welfare

The demand function for a provider is the probability that the utility from that alternative is higher than the utility from any of the other alternative. Most of the previous studies on the demand for medical care in developing countries have assumed that these demand functions take on a multinomial logit (MNL) form.[7] As discussed in McFadden (1981), the MNL suffers from the Independence of Irrelevant Alternatives assumption. This assumption is equivalent to assuming that the conditional utility functions are uncorrelated across alternatives, and imposes the restriction that the cross-price elasticities are the same across alternatives. A computationally feasible generalization of the MNL is the Nested Multinomial Logit (NMNL), which was introduced in McFadden (1981). The NMNL allows for correlation across subgroups of alternatives and, therefore, non-constant cross-price elasticities.

There are three medical care choices in the rural Cote d'Ivoire; let choice 0 be self-care, choice 1 be clinic, and choice 2 be hospital care. The η_j's imply that the hospital and clinic alternatives may be correlated with each other, but not with the self-care alternative. Therefore, the self-care demand function (i.e. the probability of choosing self-care) is

$$\Pi_0 = \frac{\exp(V_0)}{\exp(V_0) + \left[\exp(V_1/\sigma) + \exp(V_2/\sigma)\right]^{\sigma}} \tag{14}$$

and the probability of choosing a hospital or clinic is

$$\Pi_i = \left[1 - \Pi_0\right] \frac{\exp(V_i/\sigma)}{\exp(V_1/\sigma) + \exp(V_2/\sigma)} \qquad (i = 1,2) \tag{15}$$

where σ is one minus the correlation between the hospital and clinic conditional utility functions introduced by the η_j's. McFadden (1981) shows that σ must be between zero and one for the model to be consistent with utility maximization, and when $\sigma = 1$ the NMNL reduces to an MNL.

The estimated demand functions can be used to project the impact of user fees on demand (and revenues), and on the number of people who do not seek health care as a result of user fees. These demand functions also form the basis of our measurement of the willingness to pay for reduced travel time to a medical care facility. The willingness-to-pay measure is calculated as a compensating variation.[8] For example, consider changing the vector of provider travel times from T to T$'$. Following Small and Rosen (1981), in the case of a nested multinomial logit, the amount of income that an individual must be given to make him as well off at T$'$ as he or she was at T is

$$\begin{aligned} cv = (1/\lambda)\Big\{&\ln\Big[\exp(V_0) + \Big(\exp(V_1/\sigma) + \exp(V_2/\sigma)\Big)^{\sigma}\Big] - \\ &\ln\Big[\exp(V_0') + \Big(\exp(V_1'/\sigma) + \exp(V_2'/\sigma)\Big)^{\sigma}\Big]\Big\} \end{aligned} \qquad (16)$$

where V_j and V_j' are evaluated at T and T$'$, respectively, and where λ is the marginal utility of income.[9]

IV. THE DEMAND FOR MEDICAL CARE IN COTE D'IVOIRE

Data and Institutional Structure

The data used in this study come from the 1985 Cote d'Ivoire Living Standard Survey (CILSS). This multi-purpose household survey collected data on many socio-economic factors including information on illness and medical care utilization in the four weeks prior to the survey.[10] In addition, the CILSS collected community level information in rural areas. For each village, information on travel time to the nearest available medical facility of every type, and average male and female agriculture wage rates were obtained. When a facility was available in the village, travel time was recorded as zero.

The sample used for estimation excluded non-farm households and households in villages for which the community information was not completed. The exclusion of non-farm households reduced the sample by 7%, and the exclusion of villages without community level data reduced the sample by another 8%. The final sample included 980 adults and 744 children under age 16, all of whom experienced an accident or illness in the four weeks prior to the survey.

Since there are no private health care facilities in rural Cote d'Ivoire, persons who wish to obtain medical care must choose between government clinics and hospitals. These government facilities had no user fees in 1985, implying that the price of care was the opportunity cost of time spent of obtaining care. The opportunity cost of time is calculated as the product of the round-trip travel time and the appropriate village agricultural wage rate. For children the opportunity cost of the mothers' time is used.[11]

Monthly income is measured as the annual value of total household consumption divided by 12, which is a reasonable approximation of household permanent income.[12] Using consumption rather than reported earning allows us to include the value of home production. Home production is a major non-market source of income in subsistence economies. In rural Cote d'Ivoire, the value of homegrown produce consumed by household amounts to approximately half of the food budget and 30% of total consumption. Another reason to prefer consumption is that transitory shocks affect consumption much less than earnings.

The arguments of the alternative specific utility of quality functions specified in (11) are individual and family characteristics that may affect quality and the marginal utility of quality. Variables that may influence the efficacy of medical care include age, the number of healthy days last month, education, the number of other adults in the household, and the number of children in the household. Age and the number of healthy days proxy for health status. Age is entered in spline form with the break occurring at 40 years old for adults and at 3 for children. The break points were determined by grid searches. Education (years of schooling) is included since more educated individuals may be better able to implement recommended treatments and therefore produce more health relative to self-care than can less educated individuals. In the case of children the mother's education is used. The family composition variables are included because the more adults and fewer children in the household the better able a household may be at self-treating an illness. Variables that may affect the marginal utility of quality include age, sex, household composition, and the size of the farm measured in hectares of land. Descriptive statistics of the variables discussed in this section are presented in Table 1.

Table 1: Descriptive Statistics

	Adults		Children	
Variable	Mean	Standard Deviation	Mean	Standard Deviation
Clinic [a/]	0.24	(0.49)	0.30	(0.55)
Hospital [a/]	0.15	(0.38)	0.14	(0.37)
Clinic Travel Time [b/]	1.18	(1.32)	0.92	(1.16)
Hospital Travel Time [b/]	1.90	(.92)	1.56	(1.60)
Monthly Family Income [c/]	97.85	(81.19)	108.41	(99.66)
Hourly Wage [d/]	75.48	(28.54)	74.89	(26.42)
Age	44.85	(17.12)	6.33	(3.64)
Male	0.46	(0.50)	(0.54)	(0.50)
Education	0.85	(2.16)	0.91	(2.88)
Healthy Days	18.60	(9.94)	22.34	(7.24)
Number of Adults	4.57	(2.96)	4.62	(3.01)
Number of Children	4.86	(2.44)	4.97	(2.77)
Hectares of Land	8.42	(8.75)	9.33	(11.72)
Sample Size	980		744	

a/ Binary variables; equals one if alternative is chosen and zero otherwise.

b/ Round trip travel time; reported in hours.

c/ Reported in thousands of Ivorian CFA's. In 1985, the exchange rate was approximately 461 CFA per U.S. dollar.

d/ Reported in CFA's.

Estimation Results

The NMNL was estimated by full information maximum likelihood separately for the adult and children samples.[13] The results are presented in Table 2, and are generally consistent with economic theory. The estimated value of σ is 0.26 for the adult model and 0.47 for the children model. The estimates are both significantly less than one and significantly greater than zero at the 1% level. Therefore, the models are consistent with utility maximization, and the data reject the MNL in favor of the NMNL.

In both models the coefficients on the consumption and its square are significantly different from zero. Prices enter the model via these terms. If the prices did not vary across alternatives, the coefficients of the consumption terms would not be identified, since the value of consumption would then be constant across alternatives. The fact that these coefficients are significant implies that the relative prices of the alternatives are important determinants of provider choice. The direction and magnitude of the price and income effects is examined in the next section.

In the model for adults the coefficients on the first age splines are not significantly different from zero, implying that age differences between 16 and 39 do not influence provider choice. The coefficients on the age forty and over splines are negative and significant, showing that after age 40 the probability of obtaining medical care in case of injury or illness declines with age. The effects of sex and education are not significantly different from zero. The negligible education effect is most likely a result of the small variation in education in the sample. Not surprisingly, the number of healthy days last month significantly reduces the probability of seeking

Table 2: Nested Multinomial Logit
Coefficient Estimates and T-Statistics

Variable	Adults		Children	
	coefficient	t-statistics	coefficient	t-statistics
Consumption (α_1)	13.67	(5.18)	18.97	(4.47)
Consumption Squared (α_2)	-0.03	(2.56)	-0.02	(1.82)
Sigma	0.26	(3.07)	0.47	(3.67)
Clinic Alternative				
Constant	0.07	(0.04)	2.12	(2.21)
Age 1	0.03	(0.65)	-0.54	(2.19)
Age 2	-0.14	(2.43)	0.03	(0.55)
Education	-0.02	(0.14)	0.02	(0.41)
Healthy Days	-0.13	(2.26)	-0.05	(1.84)
Male	0.08	(0.15)	0.36	(1.02)
Children	0.21	(1.65)	-0.12	(1.74)
Adults	-0.12	(0.90)	-0.22	(2.27)
Land	0.07	(1.44)	0.03	(1.59)
Hospital Alternative				
Constant	1.25	(0.68)	2.36	(2.22)
Age 1	0.00	(0.09)	-0.59	(2.19)
Age 2	-0.14	(2.54)	0.02	(0.38)
Education	-0.04	(0.25)	0.02	(0.29)
Healthy Days	-0.16	(2.78)	-0.08	(2.50)
Male	0.68	(1.13)	0.09	(0.23)
Children	0.19	(1.47)	0.14	(1.62)
Adults	-0.19	(1.31)	-0.20	(1.97)
Land	0.10	(2.32)	0.04	(1.64)
Sample Size	980		723	
-Log Likelihood	830.96		655.50	

medical care.[14] The number of adults in the household has a negative effect on the probability of going to both clinics and hospitals, while the number of children has positive effects. Finally, the coefficient on land is positive for both clinics and hospitals, but significant only in the hospital equation.

In the model for children, the coefficients on the age splines show that demand falls with age from zero to three years old and is flat thereafter. As in the adult model, education and sex do not appear to influence provider choice. Again, better health reduces demand as the number of effect of healthy days is negative and significant. Finally, the number of children, number of adults, and land variables influence childrens' choices much in the same way as they influence adults' choices.

Price Elasticities and Income Effects

Since prices and income enter the demand functions in a highly non-linear fashion, it is hard to assess the direction and magnitude of their effects on demand. To facilitate this, we present arc price elasticities of the demand for clinic and hospital care by income quartiles in Table 3. The arc elasticities are obtained by sample enumeration within each income quartile.[15] They were calculated for three range of 50 CFA each, covering 0 to 150 CFA. Reading down a column of Table 3 reflects the change in the price elasticity moving down the demand curve, holding income constant. Reading across a row of Table 3 reflects the change in the price elasticity as income rises, holding price constant.

Two types of elasticities are presented in Table 3. The first is the "own" price elasticity which calculates the percentage change in demand with for a 1% change in price. For example, an increase in the clinic price causes some individuals to substitute hospital care for clinic care, and others to substitute self-care for clinic care. The own price elasticity measures the total change in clinic demand. The second type is the "net" price elasticity, which examines the portion of demand that leaves the professional health care market for self-care. The own elasticity is useful for determining the effect of various pricing policies on a facility's utilization and revenues, and the net elasticity is of interest because it measures the number of individuals forced out of the medical care market as a result of the policies.

We begin with a discussion of the own price elasticities. Clinic and Hospital demand are both substantially more elastic at higher prices as the own price elasticities increase three fold on average over the price range considered. The results also show that demand is vastly more elastic at the lower income levels. The clinic own price elasticities for the lowest income quartile are between three and six times larger than those for the highest income quartile. A similar pattern emerges for hospitals. These results indicate that user fees will be regressive and substantially reduce the facility's utilization by the poor.

The net price elasticities are approximately one-third the price elasticities, but are non-trivial in magnitude in the three lower income quartiles. This implies that increasing user fees will substantially reduce the utilization of any medical care by the poor.

Table 3: Arc Price Elasticities by Income Quartile

Price Range	Quartile 1 (lowest) Own	Quartile 1 (lowest) Net	Quartile 2 Own	Quartile 2 Net	Quartile 3 Own	Quartile 3 Net	Quartile 4 (highest) Own	Quartile 4 (highest) Net
Adults-Hospital								
0-50 CFA	-0.48	-0.14	-0.41	-0.11	-0.35	-0.09	-0.11	-0.03
50-100	-0.95	-0.24	-0.80	-0.19	-0.66	-0.15	-0.17	-0.04
100-150	-1.52	-0.43	-1.26	-0.27	-1.03	-0.21	-0.23	-0.05
Adults-Clinic								
0-50 CFA	-0.37	-0.15	-0.33	-0.12	-0.30	-0.10	-0.12	-0.04
50-100	-0.73	-0.25	-0.65	-0.21	-0.59	-0.16	-0.19	-0.06
100-150	-1.17	-0.37	-1.06	-0.30	-0.94	-0.23	-0.24	-0.08
Children-Hospital								
0-50 CFA	-0.79	-0.29	-0.70	-0.26	-0.61	-0.21	-0.22	-0.07
50-100	-1.58	-0.51	-1.38	-0.46	-1.18	-0.36	-0.31	-0.09
100-150	-2.46	-0.73	-2.16	-0.67	-1.83	-0.52	-0.34	-0.10
Children-Clinic								
0-50 CFA	-0.58	-0.30	-0.54	-0.27	-0.48	-0.22	-0.20	-0.10
50-100	-1.22	-0.56	-1.12	-0.50	-0.99	-0.40	-0.31	-0.15
100-150	-1.99	-0.85	-1.86	-0.74	-1.61	-0.58	-0.36	-0.17
Mean Income CFA	32,500		62,490		96,350		200,610	

Welfare Neutral Prices

In this section we evaluate the effect on consumers' welfare of the proposal to locate clinics in villages that currently have no facilities and then charge user fees for access. To be efficient the user fee should be set at marginal cost. The benefit to individuals from implementing this proposal depends on whether the reduction in welfare resulting from having to pay user fees is less than the improvement in welfare from having access to medical care facilities within the village. The welfare neutral fee is the amount consumers would be willing to pay not to have to travel to the closest free facility in a nearby village (i.e. the compensating variation). If the welfare neutral fee is more than the marginal cost of medical care, then the policy is welfare improving and more individuals will utilize medical care. On the other hand, if the welfare neutral fee is less than marginal cost, then the policy would reduce welfare and medical care utilization. Clearly, the magnitude of the welfare gain (or required subsidy) will vary by income level as relatively well off families are likely to be willing to pay more than are poorer families.

The welfare neutral prices are derived from compensating variation experiments. Four welfare neutral prices are calculated for an average individual in each income quartile; how much an individual is willing to pay not to have to travel to a free clinic that is 0.5 hours away, 1.0 hour away, 1.5 hours away, and 2.0 hours away. The experiments are conducted assuming that the closest hospital is two hours away.

The welfare neutral prices are reported in Table 4. Reading down a column shows the change in the price as the distance of the clinic rises, holding income constant. Reading across a row shows the change in the price as income rises, holding distance constant. The welfare neutral prices increase with distance and income for both children and adults. Adults in the highest income quartile are willing to pay three times as much as adults in the lowest income quartile, and children in the highest income quartile are willing to pay twice as much as children in the lowest income quartile.

Now we assess the welfare implications of locating clinics in villages that currently have no facilities and setting user fees at the marginal cost of supplying medical care. The effect on welfare is determined by comparing the welfare neutral price to the marginal cost of providing clinic care. We consider the effect of a reduction in travel time of two hours. As an estimate of marginal we use the average price of private medical care in urban areas. From the urban component of the CILSS, the average price of visit to a private medical provider was 35 CFA. From Table 4, our estimates show that individuals in lower half of the rural income distribution are <u>not</u> willing to pay 35 CFA, but individuals in the top half are willing to pay that amount and more. Hence, under this scenario, implementing the user fee proposal will <u>improve</u> the welfare of individuals in the top half of the income distribution and increase their utilization of medical care. However, implementing the user fee proposal will also <u>reduce</u> the welfare of individuals in the bottom half of the income distribution and lower their utilization of medical care. Hence, the user fee proposal would be regressive in rural Cote d'Ivoire in that it would benefit the wealthy and hurt the poor.

Table 4: Amount Willing to Pay to Avoid Traveling for Clinic Care

Distance to Nearest Clinic	Quartile 1 (lowest)	Quartile 2	Quartile 3	Quartile 4 (highest)
Adults				
.5 hours	7.53	8.37	10.10	17.56
1	13.82	15.50	18.78	33.57
1.5	18.82	21.28	25.89	47.95
2	22.44	25.64	31.33	60.68
Children				
.5 hours	12.36	12.97	14.86	19.56
1	20.32	21.57	24.69	33.39
1.5	24.98	26.81	30.59	42.37
2	27.40	29.61	33.70	47.59
Mean Income	32,500	62,490	96,350	200,610

V. CONCLUSIONS AND POLICY REFORM

We provide a methodology for the ex ante evaluation of the welfare effects of proposals to use user fees to finance improved access to social services in rural areas of developing countries. The analysis requires estimation of demand functions, from which price elasticities and the willingness to pay for improved access can be obtained. The willingness to pay is the maximum user fee (welfare neutral price) that can be charged without reducing individuals' welfare and utilization of medical services. The estimation is complicated by the problem that developing governments often are the dominant suppliers of social services in their countries, and provide these services for free so that there is little price variation in the data. We show how variation in individuals' private time prices can be used to identify all of the parameters of the demand functions.

The methodology is used to evaluate the possible implementation of the user fee plan for medical care clinics in rural Cote d'Ivoire. Our results show that it is likely to have highly regressive welfare effects. Specifically, the policy is shown to increase the welfare and medical care utilization of individuals in the top half of the income distribution, while reducing the welfare and medical care utilization of individuals in the bottom half of the income distribution.

These adverse distributional effects can be avoided by introducing price discrimination into the user fee proposal. User fees at clinics in poorer villages can be set at different levels than user fees in richer villages. As long as the user fees are below the welfare neutral prices, the policy will be welfare improving for everyone. The degree to which the price is below the welfare neutral price determines the improvement in welfare and medical care utilization achieved by this policy. With this type of price discrimination, the clinics in richer villages are self financing, while the clinics in poorer villages require a subsidy.

ENDNOTES

1 For a detailed description of medical care delivery systems and pricing policies in developing countries see de Ferranti (1985)

2 The user fee proposal is discussed in Jimenez (1987).

3 The role of time prices in theory of the allocation of time was first applied to the demand for in medical care in Phelps and Newhouse (1974) and Acton (1975).

4 Studies of the demand for health care in developing countries that employ this specification include Akin et.al. (1981, 1985 and, 1986), Birdsall and Chuhan (1986), Dor and van der Gaag (1987), and Mwabu (1986). Heller (1983) and Musgrove (1983) estimate family medical care expenditure functions but do not consider price effects.

5 The time spent obtaining care could, in principle, come at the expense of work in the market place, production work at home or leisure. In that case, income Y_j, and net consumption, C_j, should incorporate the value of the three activities. In an economy that is only partially monetized, such as the one in rural Cote d'Ivoire, non-traded home production is a major source of income. We capture this by including the value of home production consumed by the household into the measure of income. However, adding the value of leisure would greatly complicate the model and is left for future work. The measurement of income is discussed in Section IV.a.

6 Some authors try to include income in the model by allowing alternative specific coefficients on consumption. This specification is inconsistent with stable utility maximization because it implies that two options that have the same quality and price must yield different levels of utility. This specification has been employed by Akin et.al. (1981, 1985 and, 1986), Birdsall and Chuhan (1986), Dor and van der Gaag (1987), and Mwabu (1986).

7 The exceptions are Gertler, Locay, and Sanderson (1987) and Dor, Gertler, and van der Gaag (1987) who employ Nested Multinomial Logit specifications.

8 See Deaton and Muelbauer (1980) for discussion of compensating variation and other welfare measures.

9 In order for (16) to be exact, the marginal utility of income λ must be independent of alternative specific characteristics and price. See McFadden (1981) and Small and Rosen (1981) for more discussion on this point. Although λ is independent of quality, it is not independent of price. Specifically

$$\lambda = \partial U/\partial Y = \alpha_1 + 2\alpha_2(Y - P).$$

Since the prices are very small relative to income, λ is likely to be approximately constant across small differences is price. Hence, each individual's average marginal utility of income over the alternatives is a good approxima-

tion of λ. Since this approximation is calculated for each individual, λ will vary greatly across individuals as there is substantial variation in income.
10 For detailed information on this survey see Ainsworth and Munos (1985).

11 The male and female village agricultural wage rates are reasonable estimates of the opportunity cost of time. Newman (1987) shows that 97% of all working adults in rural areas of Cote d'ivoire are engaged in agricultural activities. Moreover individual variation in wage rates within village is likely to be small since over 90% of the adults have less than one year of schooling.

12 For a description on how total household consumption was calculated see Glewwe (1987).

13 Hensher (1986) shows that full information maximum likelihood estimation of the NMNL yields substantial gains in efficiency over the more popular two-step estimator.

14 The number of days an individual was healthy may be endogenous in a model of medical care demand. To ensure the robustness of our price and income effects, we reestimated the model on both adult and children samples. There was no difference in the estimated coefficients.

15 See Train (1986) for a discussion on elasticities and sample enumeration in discrete choice models.

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THE WILLINGNESS-TO-PAY FOR MEDICAL CARE

Evidence from Two Developing Countries

Paul Gertler
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Washington, D.C. 20433

The Willingness-to-Pay for Medical Care: Evidence from Two Countries

Table of Contents

Acknowledgments

[To be written]

Guide to the Reader

Readers who want to get a quick overview of the contents of this book are advised to read the Introduction, the summary sections that are added to Chapters 2 through 7 and the concluding chapter. Those who want to familiarize themselves with the general issues of health-care financing in less developed countries should read Chapter 2 and, for more detail on health-care infrastructure, Chapter 3. Those two chapters could be skipped by readers who are thoroughly familiar with the health-care systems in the developing world and their financing problems.

Chapter 4 is a non-technical chapter introducing some concepts of welfare economics, as they relate to health-care. This chapter is added to help non-economists to follow the analysis presented in subsequent chapters.

Chapter 5 contains the main theoretical part of this study. It is rather technical, but it is a must for those readers who want to scrutinize the theoretical base of our empirical work. The latter is presented in Chapter 6, which is perhaps the most important chapter.

Readers not interested in the details of the theoretical and empirical work, could make do with reading just the summaries of Chapter 5 and 6 and turning immediately to the policy implications of our findings, which are presented in Chapter 7. This chapter and the concluding one are recommended to anyone who took the trouble of picking up this book.

CHAPTER 1

Introduction

This study is about money. Money to pay for delivering health services in developing countries. It is motivated by the general observation that the health status of the population in less developed countries (LDCs) is well below that in the industrialized world, and that the distribution as well as the quality of health-care in LDCs leave much to be desired. It is well-known that the general lack of resources for health-care services in LDCs is a major cause of this sad state of affairs.

The first chapters of this book show how important health-care is in the development process. We give arguments for the heavy government involvement in the provision of medical care, both in developed and developing countries, and illustrate the shortcomings of the health-care infrastructure in LDCs. The latter is based on detailed information on two countries: Côte d'Ivoire and Peru. In subsequent chapters these countries are used as case studies for the specific, and relatively narrow question we will try to answer: are user fees for medical care a desirable and feasible alternative to government financing?

Throughout the developing world governments provide the bulk of resources for the health-care system. Subsidies for medical education, capital for government hospitals, subsidized drugs and free clinic and hospital services are the rule, not the exception. In this, LDCs do not differ much from industrialized countries where government intervention in the health-care sector ranges from subsidies for selected groups of the population

(e.g. the aged), via general public health insurance schemes, to complete public health-care provider systems in which the government provides medical care free of charge to the entire population.

The main difference between the developed and the developing world is that in the latter resources are much more scarce. Though many other problems can be pointed at - inefficient use of available resources, bias towards the provision of curative rather than preventive care, preferential treatment of politically powerful constituencies - the overall picture is that of a general lack of resources. This picture has become worse during the global recession of the eighties. Oil shocks in the late seventies, combined with tight monetary and fiscal policies in the major industrialized countries, triggered this recession. Oil-importing developing countries were particularly hard hit, but many other LDCs suffered from low prices for their commodity exports, and from low demand for their products in general. The developing world resorted to heavy borrowing which, combined with the sharp increase in interest rates, sky rocketed their debt service costs. For example, Cline (1985) reports that in 1973-77 15.4 percent of export earnings were used to service the debt. In 1985 many countries in Africa and Latin America spent 30 to 55 percent of their export earnings for servicing the debts (e.g. Kakwani, 1988).

Faced with unattainable unbalances in their economy, developing countries started so-called adjusted programs, under the auspicious of the International Monetary Fund and the World Bank. A typical structural adjustment package includes tight fiscal and monetary restraints, and usually results in a significant fall in domestic output, real wages and private consumption levels. Some have argued (e.g. Cornia, et al., 1987) that such

austerity measures have put an unexceptable burden on the poor in these countries, especially through cuts in social sector spending (food subsidies, health-care, education). Few, though, question the necessity of stabilization and adjustment measures for countries with unsustainable unbalances in their economy.

It is well beyond the scope of this study to discuss the pro's and con's of the macro-economic policies that are currently being promoted by the international development community. The importance of the current macro-economic situation in LDCs lies in the recognition that resources are severely constraint, that a return to sustainable economic growth appears to take more time than initially expected, and that fiscal constraint is a major element of the policies put in place to promote such growth.

The latter has an immediate bearing on our study. If the health-care systems in LDCs suffer from lack of resources, and if one can no longer depend on increased government expenditure, where can we find the necessary resources to improve the health-care structure? The common answer to this question is to introduce (or increase) user fees in the system, i.e. let the consumer/patient pay a larger share of the cost.

The feasibility of such a solution depends heavily on the price sensitivity of the demand for medical care. There are two issues here: First, how price elastic is the demand for medical care in general? Clearly, if small changes in the price result in large reductions in utilization, the amount of extra revenues raised will be small, too small perhaps to justify the policy. Secondly, is the demand for medical care for some groups in the population more/less price sensitive than for others? For instance, if the poor, or the aged, or women or children are more price-sensitive than, say,

relatively well-to-do prime aged males, a user fee policy may have distributional consequences that are socially or politically undesirable.

The main part of this study is devoted to answering these two questions. We will answer these questions by analyzing the health-care provider choice of households in rural communities in two developing countries. The answers to these questions are simple: yes, the demand for medical care is price sensitive, but not so that it prevents user fees from being a viable option for resource mobilization. An yes, the poor as well as children will be hurt more by the introduction of user fees than the population in general.

These empirical results are presented in Chapter 6. Their policy implications are demonstrated in Chapter 7, where we simulate the consequences of alternative pricing policies. These consequences are evaluated using three criteria: effects on health care utilization (including the distributional aspects), the potential for revenue raising, and the economic welfare effect on the population.

These two chapters form the core of the empirical study. The rest of the book is devoted to defining the problem and developing a theoretical framework for the analysis. In Chapter 2 we illustrate the importance of health in the development process. In this chapter we also provide and evaluate the main arguments that are usually put forward to justify the heavy government involvement in the health-care system. Chapter 3 provides background information on health and medical care on two continents: Africa and Latin America, with emphasis on Côte d'Ivoire and Peru. Chapters 4 and 5 provide the analytical and theoretical underpinnings of our subsequent empirical work.

In the concluding chapter we rejoin the debate for and against user fees for medical care. We also discuss some of the caveats of our study and provide, inter alia, an agenda for future research. In the final section of that chapter we give suggestions on how, armed with the new empirical evidence, user fees can be introduced in the health-care system in a way that puts a heavy emphasis on the need to protect the poor against the adverse effects of user fees policies.

CHAPTER 2

Health, Health-Care And Development

The health status of the population is one of the most important factors in the economic development process for at least two reasons. First, as an indicator of economic development, it shows the success or failure of a country to provide for the most basic needs of its people (food, save sanitary conditions, shelter, etc). Secondly, health - a form of human capital - is an input in the further development of a country. Health influences the labor supply and productivity of adults and the school enrollment and school performance of children. Furthermore, high infant and child mortality rates are among the most important factors related to high fertility rates which, in turn, play a crucial role in development. (See, among others, Krueger, 1968; World Bank; 1980, Wheeler, 1980, Hicks, 1980 and Balassa, 1985 for a discussion of the roel of human capital in economic development).

As a stylized fact, the correlation between crude health indicators such as child mortality and life expectancy, on the one hand, and per capita income on the other is well documented (e.g. Preston, 1980; Golladay, and Liese, 1980; World Bank, 1980). Another important stylized fact is the correlation between expenditures for medical care and per capita income. Indeed, as we will show in Section 2, this correlation is so strong that, especially for poor countries, knowledge of a country's per capita income suffices to obtain a fairly accurate prediction of its per capita expenditures for medical goods and services.

Given that medical care directly aims at improving the health status of the population and given the correlations between health and economic development and between development and health-care expenditures, one would perhaps expect a somewhat stronger relationship between health status and medical care expenditures than is usually found. We turn to this relationship in Section 3. Our aim is not to develop a model that shows the causal relationships between the three variables of interest: health, health-care and development. Rather, by showing the correlations, we want to highlight one set of reasons why the health status of a population is of such primary concern to policy makers in the developing world as well as in industrialized countries. This concern is frequently manifested in heavy government involvement in the health-care sector, ranging anywhere from the provision of public health-care insurance for selected population groups, to the constitutional right of every citizen to have access to free medical care.

In Section 4 we discuss another set of issues that help explain why in most countries the government is heavily involved in the provision of medical care. Although in many aspects health-care is a "normal" good, with positive income and negative price elasticities, certain aspects of health and medical care make it less desirable to leave the provision of medical goods and services to market forces alone. This does not necessarily mean that government intervention is the appropriate panacea. But, at the very least, it provides an additional explanation for the involvement of governments in the health-care sector.

In the last section of this chapter we turn to the merits and potential hazards of government intervention in the market for medical goods and services. We discuss in general terms the various forms of intervention,

especially as they relate to issues of health-care financing. We also acknowledge the financial and structural constraints that governments must face. Thus, we will present the background for the more detailed and country specific discussion of the organization of health-care markets and their financing mechanisms, presented in Chapter 3. But first we will present a simple descriptive analysis based on aggregated data from 34 countries referring to the year 1975.

2.1. Health and Development

There is a strong positive correlation between health and development. This is demonstrated in Figure 1 where we plot four health indicators against per capita Gross National Product (GNP). The indicators are life expectancy at birth, infant and child mortality rates and the crude death rate, (obtained from the Social Indicators database, World Bank, 1986). The countries chosen are the same as those included in Kravis et al. (1982) and represent all stages of development.[1/] The countries are listed in Table 1 in ascending order of per capita GNP. The lines drawn through the scatter diagrams represent double-logarithmic regressions. The regression results are presented in Table 2.

1/ The Kravis data include information on health-care expenditures. The expenditure data are adjusted so as to be fully comparable across countries. We will use these data in Section 2.2.

Table 1. **Gross National Product Per Capita; Selected Countries 1975** 1/

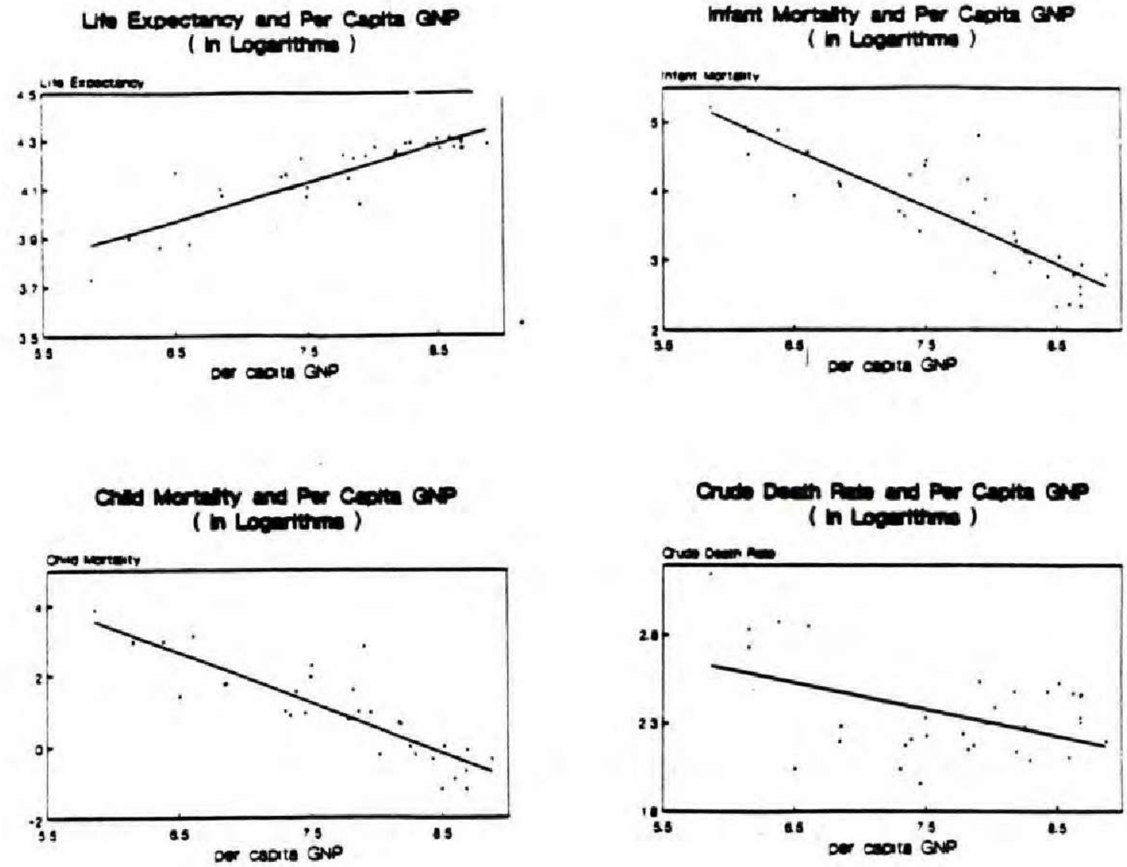
1. Malawi	$ 351	18. Iran	$ 2704
2. Kenya	470	19. Uruguay	2844
3. India	470	20. Ireland	3048
4. Pakistan	590	21. Hungary	3558
5. Sri Lanka	667	22. Poland	3597
6. Zambia	737	23. Italy	3861
7. Thailand	936	24. Spain	4010
8. Philippines	996	25. United Kingdom	4587
9. Korea	1484	26. Japan	4906
10. Malaysia	1540	27. Austria	4994
11. Colombia	1608	28. Netherlands	5397
12. Jamaica	1722	29. Belgium	5574
13. Syria	1794	30. France	5876
14. Brazil	1811	31. Luxembourg	5883
15. Romania	2386	32. Denmark	5910
16. Mexico	2487	33. Germany	5952
17. Yugoslavia	2591	34. USA	7176

1/ Source, Kravis (1982); all data are 1975 US dollars.

These familiar diagrams demonstrate the wide range of health status across countries. Life expectancy at birth ranges from 41.7 years in Malawi to 74.6 years in The Netherlands. Infant death rates range from 10.3 to 184.0 per thousand and the crude death rate ranges from 6.2 in to 23.3.

The diagrams also show the very strong correlation between health and income levels. The associated regression coefficients in Table 2 are all significantly different from zero at a better than 1 percent confidence level and the adjusted R-squares show that, except for the crude death rate, per capita income is a fairly good predictor of health status. The regression results suggest that a 10 percent increase in per capita GNP corresponds roughly with an increase of 1 year in life expectancy, an 8.3 percent

FIGURE 1: Health Indicators and GNP (1975)



reduction in the infant mortality rate, a 14.2 percent reduction in the child mortality rate, and a 1.5 percent reduction in the crude death rate.

Table 2. Regression Results[1]: Health and Development
(T-Values in Parenthesis)

	Life Expectancy	Infant Mortality	Child Mortality	Crude Death Rate
Constant	2.951 (26.84)	10.024 (14.96)	11.851 (11.52)	3.510 (8.75)
GNP, Per Capita	.157 (11.09)	-.833 (9.65)	-1.415 (10.68)	-.151 (2.91)
$\bar{R}^2$	.787	.737	.774	.185

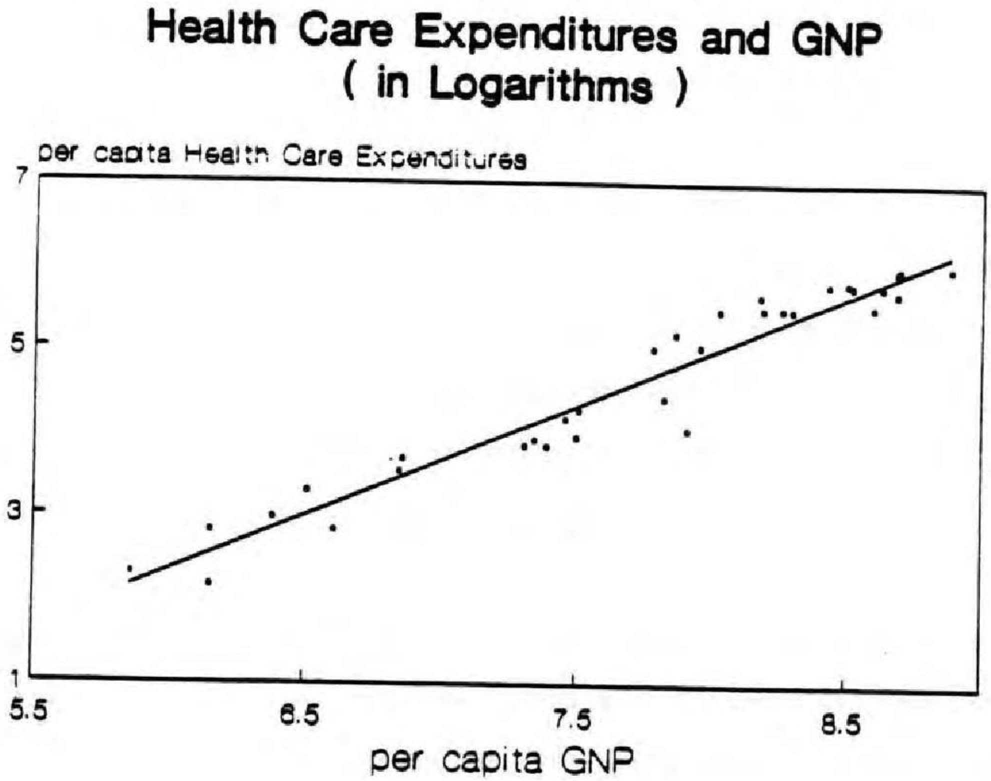
1/ Variables measured in logarithm.

2.2 Development and Health-Care Consumption

Of course, income *per se* does not produce good health. There is ample evidence, both from micro and macro studies, that income is a proxy for improved nutritional status, safer sanitary conditions, better housing conditions, higher education levels, etc. All of these factors contribute, directly or indirectly, to an improvement in overall health status. The most direct intervention that aims at improving health is the provision of medical goods and services.

Figure 2 shows the relationship between per capita health-care expenditures and per capita GNP. Per capita expenditures in this sample of countries range from US$ 8.70 in Kenya to US$ 401.29 in U.S.A. The double-logarithmic Engel curve drawn through the scatter diagram has a R-squared of .942 and indicates that medical care is a luxury good: the income elasticity of total health-care expenditures is 1.329 (see Table 3 below). This perhaps somewhat surprising finding is not new. Musgrove (1978) reports income elasticities about ranging form .81 to 1.34, using household income and expenditure data from ten South America cities. In a subsequent study (Musgrove, 1983), he again concludes that health-care is a luxury good (i.e. the income elasticity exceeds 1.0). Newhouse (1977) using a data set similar to ours, but for developed countries only, obtained income elasticities in the range from 1.13 to 1.31. The persistently high correlation between health-care expenditures and per capita income shows that despite a large variety of efforts "to keep health-care costs down," as evidenced by the large variety of health-care systems, insurance schemes, and other financing mechanisms we find throughout the world, in the end countries consume an amount of medical care that is determined mainly by their level of income.

FIGURE 2:


Health Care Expenditures and GNP
(in Logarithms)
per capita Health Care Expenditures
7
5
3
1
5.5
6.5
7.5
8.5
per capita GNP

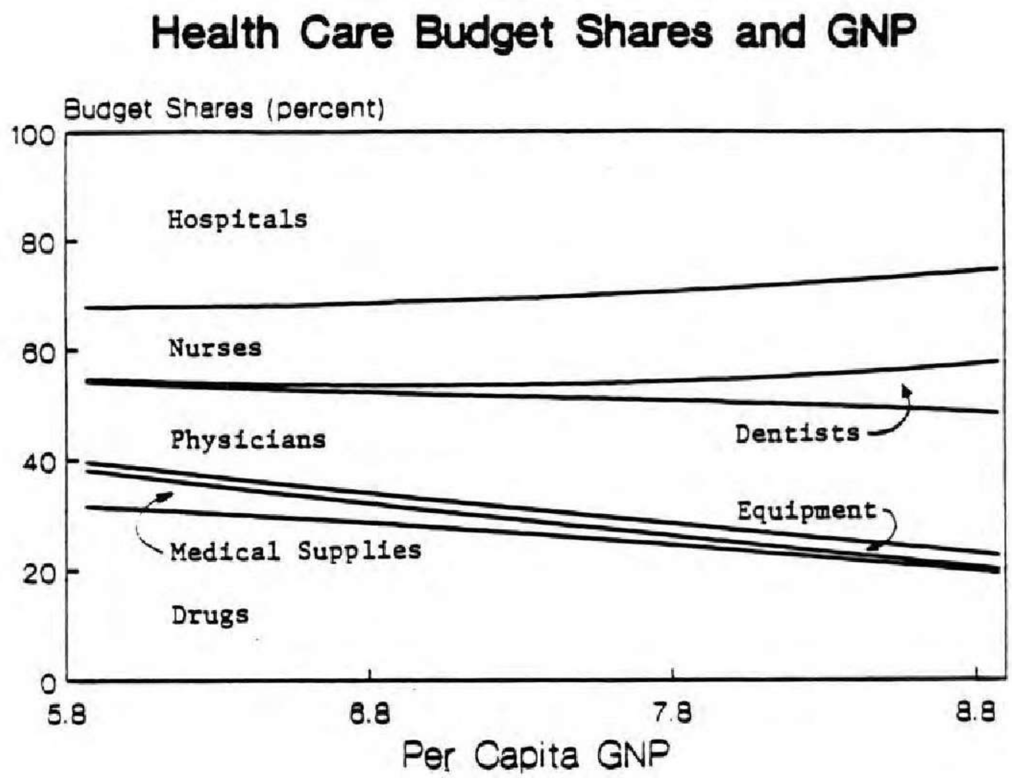
This conclusion foreshadows one of the main issues of the book: how to maintain, and indeed improve a health-care system in the light of constant or contracting resources? As we argue later on, many developing countries face declining per capita GNP's, increasing demands for medical care due to demographic and socio-economic trends, severe budgetary problems and a prolonged contraction of private consumption. Furthermore, their health-care systems already leave much to be desired: hospitals without equipment, doctors without drugs, and rural clinics without safe drinking water or electricity are often the rule rather than the exception. In periods of sustained economic growth, one may expect a more than proportional improvement of the health-care system (at least in terms of expenditures), given the apparently high income elasticity of medical care. But the same result implies that special attention needs to be given to the health-care system in times of economic recession or - at best - zero economic growth (see also World Health Organization, 1987a and 1987b). Where can we find the resources to maintain the current system? How can we generate additional resources to make the necessary improvements? These are the central questions that motivate this study.

Table 3 shows summary statistics and Engel curves (in logarithmic form) for detailed per capita health-care expenditures. Hospitals and physician services form the bigger share, but drugs and nurses also command a sizeable proportion of the total health care budget. With the exception of medical supplies, all items are luxuries in the economic sense: for the luxury items, income elasticities range from 1.361 for hospitals to 2.409 for dental services. The overall income elasticity is 1.329. The variation in

Table 3. **Average Per Capita Expenditures on Health Care and Regression Results: Health Care Expenditures on GNP** (In Logarithms)
(T-Values in Parenthesis)

	Per Capita Expenditures			Regression Results				
	Average	Standard Error	Percentage	Constant		Coefficient on GNP per capita		$\bar{R}^2$
Drugs & Med. Prep.	34.74	45.08	20.7	-6.791	(7.74)	1.276	(11.29)	.793
Medical Supplies	4.27	10.34	2.5	-4.924	(2.72)	.691	(2.97)	.191
Therapeutic Equip.	4.81	7.19	2.9	-11.798	(5.476)	1.613	(5.81)	.499
Physician Services	37.64	49.17	22.4	-9.618	(11.26)	1.627	(14.79)	.868
Dental Services	9.25	13.36	5.5	-17.564	(11.29)	2.409	(12.02)	.813
Nursing Services	28.27	39.23	16.8	-9.084	(10.17)	1.519	(13.20)	.840
Hospitals	49.25	65.73	29.3	-7.272	(6.61)	1.361	(9.61)	.735
Total	168.23	215.81	100%	-5.640	(12.45)	1.3289	(22.77)	.940

FIGURE 3


Health Care Budget Shares and GNP
Budget Shares (percent)
100
80
60
40
20
0
Hospitals
Nurses
Physicians
Dentists
Equipment
Medical Supplies
Drugs
5.8
6.8
7.8
8.8
Per Capita GNP

elasticities implies that the shares within the health-care budget will change with development. We show this in Figure 3 for an average country.

2.3. Health Production Functions

As we have seen above, income is a pretty good predictor for a nation's health status as measured by such crude indicators as mortality rates and life expectancy. Behind this observation lies a large and complex set of factors that, at the micro level, influences individual health status. Aggregated over all individuals one can imagine a health production function that summarizes the complex causal chains that have an impact on individual health. In this section we will estimate the simplest of such an aggregated reduced-form health production function. The nature of the data available prevent us from formulating a convincing structural model that shows how nations, through a rational use of their scarce resources, are able to increase the health of their population and how, in turn, this improved health contributes to further economic development. Our goal is much less pretentious and is in the same spirit as the descriptive analyses of the previous two sections. We want to investigate whether the more than proportional increase in health-care expenditures that accompanies economic growth, contributes to the health of the population, while taking the effects of some other factors into account.

Factors, other than medical care, that come immediately to mind as being relevant to a population's health status are education, overall consumption levels and general living conditions. As a proxy measure for education we use the country's illiteracy rate. We expect private consumption

levels to be of importance especially with regard to food consumption. Average calory intake is used as a proxy for food consumption. The overall living conditions refer to such amenities as access to public services, save drinking water, safe sewerage systems, etc. Though far from being an ideal measure, we will use the population density to represent these factors. The health measures used are the same as those introduced in Section 2, while the consumption of medical goods and services is represented by per capita health-care expenditures (from Section 3). The health production functions are estimated in double logarithmic form. Estimation results are presented in Table 4.

Table 4. **Health-care Production Functions** (T-Values in parenthesis)

	Life Expectancy	Infant Mortality	Child Mortality	Crude Death Rate
Constant	3.110 (5.22)	10.251 (1.80)	4.752 (.57)	.454 (.15)
Literacy	.191 (7.06)	-.400 (1.54)	-.708 (1.88)	-.658 (4.84)
Pop. Density	.009 (1.38)	-.169 (2.54)	-.238 (2.46)	-.007 (.19)
Cal. intake	-.013 (.16)	-.289 (.38)	.538 (.49)	.608 (1.54)
Health exp. Per Capita	.062 (3.56)	-.412 (2.48)	-.868 (3.60)	-.014 (.16)
$\bar{R}^2$	.941	.819	.862	.571

Perhaps the most surprising result of this simple exercise is that literacy stands out as a very important factor related to the production of health. Many studies based on micro data have shown that, for instance, parental education is an important determinant of child health status (Behrman and Wolfe, 1987a and 1987b; Strauss, 1987). Evidence from aggregated data is more scarce, but Cochrane, O'Hara and Leslie (1980) also report strong correlations between adult literacy and child health measures.

If one accepts the population density as an appropriate proxy for overall living conditions, the results show that infant and child mortality rates will fall when these conditions improve. Calory intake does not show any significant effect on health. Most likely, the distribution of food consumption, e.g. calories consumed by the poorest 20 percent of the population, is more relevant to health than the average calorie intake (see, for instance, Behrman and Deolakikar, 1987). The use of national averages obscures the relation between health and nutritional status that has been demonstrated in studies using micro data.

The most important result is the effect of health-care expenditures on health. The estimation results indicate that for a 10 percent increase in health-care expenditures one can "buy" an increase of 0.4 years in life expectancy, a 4.1 percent reduction in the infant mortality rate (from 50.7 to 48.6 on average), and an 8.7 percent reduction in the child death rate (from 6.35 to 5.8). Note that a 10 percent increase in expenditures corresponds to US$1.00 for the poorest country in this sample and to US$16.82 on average. As before, these results imply that special attention needs to be given to the health-care system in times of economic austerity. Just as sustained economic growth can be expected to lead, *ceteris paribus*, to improved health, so is a

decline in per capita income likely to result in a deterioration of the health-care system and a subsequent reduction in health status.[2/]

Despite the plausibility of these results, we would like to warn the reader not to take these estimates as proof that under all circumstances an increase/decrease in health-care expenditures will result in an improvement/reduction of the population's health status. The causal chain that produces good health is a complex one that cannot be adequately analyzed on the basis of aggregated data. However, though health-care expenditures can be wasteful or even counter productive, in general there does exist a direct causal relationship from health-care consumption to improved health. Moreover, our results correspond to those based on studies that mostly using micro data, aim at showing the causal relationships that run from income, education and the use of health services to improved health.

2.4. Government Intervention In The Health-Care Sector

The relationships between health, health-care utilization and development explain, at least in part, the political will of many governments to increase the consumption of medical care, e.g. through subsidies, or by providing health-care free of charge. The expected impact of such an increase in medical consumption, in terms of reduced suffering and an increase in health status (and, thus, productivity) provide a strong justification for interventions in the market for medical goods and services. Our results are

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2/ Cornia et al. (1987) who provided evidence about the deterioration of nutrition and health status (especially among children) during the first half of the 1980s.

consistent with the claim that such government efforts indeed result in a healthier population.

There are many other good reasons why governments should intervene in the provision of (certain types) of medical care. However, not all forms of medical care are equally effective in terms of improving the overall health level of the population. Furthermore, most types of market interventions come at a cost: be it in the form of reduced efficiency or, when the price mechanism is being replaced by some other form of rationing, in terms of undesirable inequity effects. Finally, and perhaps most importantly, governments face budgetary constraints. Without due respect to such constraints, even the best intentions of governments are doomed to fail. It is often argued that the neglect of budgetary realities, combined with other negative side effects of government interventions in the health-care market, account for the dismal state of many health-care system in the developing world.

Still, as stated above, there are several good reasons why the provision of medical goods and services should not be left to market forces alone. First of all, it is well recognized that the consumption of medical care can generate externalities. The most obvious examples of health-care programs that generate large externalities include vaccination programs, sanitation programs, the provision of clean drinking water and medical research. Though not all externalities necessarily call for government interventions, some aspects of medical care, e.g. the control of contagious diseases, are best provided by the government.

Secondly, suffering from a spell of bad health is an uncertain event, making the need to spend on medical care unpredictable. Arrow, in his seminal

article on "Uncertainty and the Welfare Economics of Medical Care" (Arrow, 1963), stressed unpredictability of medical outlays, thus providing the formal argument for the economic (welfare enhancing) efficiency of implementing some form of health insurance. Often such insurance is provided by the government, either in the form of comprehensive public insurance schemes, by providing medical care at subsidized prices, or free of charge.

Finally, but maybe even more important than all previous arguments combined, good health is widely perceived as a basic human right. Financial or other barriers to obtaining medical care are thought to be unethical or at least socially undesirable. This belief has in some countries resulted in the constitutional right for all citizens to obtain medical care fee of charge. In other countries governments have taken the role of the sole provider of medical care, usually with accompanying public insurance schemes. The belief that health is a basic human right also underlies the declaration of Alma Ata that aims at Health for All in the year 2000.

Whatever the motives, the subsequent policy measures all result in a reduction for the consumer of the price of medical care. This price reduction, has lead to two wide-spread phenomena that, in turn, have given rise to more government intervention: moral hazard and supplier-induced demand. Since any type of insurance lowers the price of the insured good to the consumer, at least at the time that the transaction takes place, the consumer has a incentive to buy more of the good than he or she otherwise would (if the good were price elastic). This phenomenon is referred to in the insurance literature as moral hazard and is sometimes said to contribute to the alleged over-utilization of some types of medical care. Regulations to counter this undesirable side-effect of health insurance include compulsory

consulta ns with general practitioners prior to obtaining more expensive speciali c or hospital care.

Supplier-induced demand refers to the possibility that physicians partly pursue their own interests when prescribing treatment for their patients. Since the fully insured patient has no incentive to search for the most cost-effective treatment, and indeed may perceive the most expensive treatment as the best one, the physician may prescribe and deliver the treatment that is most profitable for him. The literature on supplier-induced demand is quite extensive, though far from conclusive (e.g. Phelps, 1986). Measures to reduce the demand increasing effects include compulsory second opinions for major operations and innovative insurance schemes that include incentives for the physician to search for cost effective treatments. (see the extensive literature on Health Maintenance Organizations, HMO's, e.g. Welch, 1985).

The supplier-induced demand hypothesis is closely related to alleged consumer-ignorance in the health-care market. The patient suffering from a disease knows that he or she needs some form of medical care but is usually insufficiently informed to ask for a specific type and quantity drug or treatment. This consumer-ignorance has lead to a wide range of regulatory measures to protect the consumer. Health workers need to fulfill minimum requirements to obtain a license to practice, while medical education is generally provided by the government, or strongly regulated. Drugs can only be marketed after extensive safety testing and a large group of drugs can only be provided by licensed pharmacists.

2.5 Three Categories of Medical Care

In the previous section we showed that there are many special aspects of health and medical care (from sound economic arguments that call for insurance schemes to the ideological position that health is a basic human right) that provide compelling reasons for some form of government intervention in the health-care market. Indeed, the health-care system is among the most regulated industries in most countries in both the industrialized and the developing world. All interventions will, directly or indirectly, alter the price of the good or service faced by the consumer. For instance, market entrance restrictions such as licensing are likely to raise the price of medical care. Most other interventions, however, aim at reducing the price, either through direct subsidies or public health insurance schemes or, in the extreme, the public provision of free medical care. These price reductions will, at least in principle, increase the consumption of medical care and, consequently, improve the health status of the population. Given the importance of health as a public good and as an important in development, this seems a good thing, but it is important to realize that health-care is not a homogeneous commodity. It includes drugs, physician services, hospital and nursing home care, as well as immunization campaigns, sanitation services and health education programs such as advertising the benefits of regular exercises, warnings against the hazards of smoking, and guidelines for food preparation and education on the importance of boiling potentially unsafe drinking water. In the context of discussing the governments role in health-care financing it is useful to present the categorization of health-care provided by De Ferranti (1985). He distinguishes between curative care,

preventive care that is patient related and preventive care that is not patient related. The following table is taken from his study and briefly describes each of these three categories.

The strongest case for providing health-care services free of charge is for the category of non-patient-related preventive services. The argument is a very practical one: since no direct transaction takes place between the supplier of the service (e.g. pest control) and any particular clients, charging individuals who benefit from the service is simply not feasible. If a fee were charged there would be no way of limiting the benefits to those who choose to pay. This non-exclusivity argument implies that some public agent should provide such services, while the costs are covered from general revenues (taxes).

There is, in principle, no problem for charging the cost of medical care to the patient for the second category of health-care services: patient related preventive care. The child being immunized or the mother receiving pre- or antenatal care are readily identified. Still we usually find such services being provided free of charge or well below actual costs. There are two main arguments for this. First, there are externalities to certain types of preventive services that warrant subsidization. The case of contagious disease is the most obvious example. Another focus of preventive measures may be to reduce disabilities that otherwise result in large incidence of support cases to be borne by the community. (e.g. antenatal care to prevent low birth weight that may result in physical or mental handicaps). In such cases also, some form of subsidization can be defended on economic grounds.

TABLE 5. CATEGORIES OF MEDICAL CARE

I. **Curative Care**

Includes personal services (care of patients) by health facilities and independent providers, including traditional practitioners; and purchases by users of medicines. Can be subdivided into:

(i) "first-contact" services (all outpatient)

(ii) referral services (inpatient and some outpatient)

II. **Preventive care: patient-related**

Includes services to well patients, particularly infants, mothers, and pregnant women; also oral rehydration therapy and hypertension control. Delivered through maternal and child health clinics at health facilities and community health programs. Typical services are: immunization, growth monitoring, and instruction on improved breastfeeding and weaning practices.

III. **Preventive care: non-patient-related**

Includes disease control (both vector control and mass campaigns), sanitation, education and promotion of health and hygiene, control of pests and zoonotic diseases, and monitoring of disease patterns.

Source: De Ferranti, 1985, p.67.

The second argument for subsidization of this second category of health services has to do with the fact that the population may not be fully aware of the benefits of the preventive care while society as a whole ("the government") perceives such services to be of major social value. Preventive care is thus thought of as a merit good and measures are taken to increase consumption, e.g. through information campaigns and subsidies, by providing the good free of charge, or even by rewarding those who decide to consume such goods.

The case for subsidizing curative care is by far the weakest. The client is clearly identified and all benefits accrue to him or her. The overriding argument for subsidizing curative care that directly benefits the private consumer has to be the "basic right" argument. It is perceived to be socially desirable that those in need receive medical care and should not have to face financial or other barriers to access to the health care system. Policies to provide medical care to those in ill health, independent of the financial consequences, have taken many forms. In the industrialized world, some governments have sponsored programs for certain target groups (e.g. in the U.S., Medicaid for the poor and Medicare for the aged). Others have public insurance schemes that cover virtually the entire population (e.g. in The Netherlands and Germany) or have nationalized health-care systems (e.g. England, Canada). Similar systems can be found in third world countries but the dominant way of reducing the financial barrier to obtaining medical care is by direct subsidization, up to the point where health-care is provided free-of-charge.

2.6 The Role of Prices in the Health-Care Market

Of course, there is no such thing as "free" medical care. The cost has to be borne by somebody. This cost has two aspects: the cost of providing medical care and the cost of obtaining care. The latter is borne by the consumer and includes not only the fee charged, but also the (opportunity cost of the) time used to travel to the health-care facility, the cost of such travel, the waiting time, etc. Thus, even when the fee is zero, the private cost is positive (and, as we shall see later, can be quite large).

The cost of providing medical care is the sum of all the inputs: wages and salaries of the health workers, equipment drugs, hospital maintenance, etc. If medical care is financed (mostly) out of general revenues, the health-care sector has to compete with other sectors for the scarce government resources. Thus, in the aggregate, the health sector faces a budget constraint and some form of rationing has to take place, even if medical care is provided free of charge.

The many problems facing health-care systems in the developing world (and in many industrialized countries) can to a large extent be traced back by the virtual elimination of price signals in the medical market. On the supply side, investments in both human and non-human capital are no longer guided by relative prices and expected benefits. Rather they are influenced by government subsidies for medical education or stem directly from centrally planned health-care programs. Such programs often show a bias towards high-tech curative care, at the cost of low-cost primary care and preventive measures.

On the demand side consumers no longer face a financial barrier to obtaining medical care, but - given that overall resources are limited - other rationing mechanisms have taken over the place of the price - mechanism. This raises the question of how successful governments have been to increase access to medical care by subsidizing or providing the goods and services free of charge. Who receives the care? How much? How does the rationing take place in the absence of the price mechanism?

A recent World Bank Policy Study analyzed the effect of current financing mechanisms for medical care and points at the internal inefficiency of the health-care sector, as well as at the consequences on the demand side (World Bank, 1987). The conclusion on the latter is that governments have <u>not</u> been successful in providing care to those who need it. The better-off in most countries benefit more from the free or subsidized services than the poor. Rural areas in particular are badly served by public health-care facilities.

This again leads us to the main theme of this book: if the heavy subsidization of medical care in developing countries has <u>not</u> had the desired effect of providing access to those in need, what is the alternative? If governments do not have enough resources to provide adequate medical care to the population, where can additional resources be found? The frequent answer to this and indeed the answer that the World Bank's policy study proposes, is the introduction of <u>user fees</u> back into the system. Of course, the argument against user fees, i.e. they are a potential barrier to access of medical care, is exactly the reason why subsidies or free medical care were instituted in the first place. Thus before such a policy can be implemented a number of questions need to be answered, such as: for which services should fees be

charged; how high should charges be; are patients, especially the poor, willing to pay these charges and how much revenues can be raised? The answers to these questions depend crucially upon the responses of consumers to changes in the price of medical care. Is medical care price elastic? Do patients consider the price of medical care if they are ill? Will patients still use government health-services if a fee is changed? Are the poor more price sensitive than the better-off? What is the price elasticity of medical care?

Surprisingly enough, there is little empirical evidence upon which to base the answer to these questions, especially as they refer to the developing world. This study aims at filling this gap. First, in the next chapter, we will present a descriptive analyses of the health-care infrastructure, health-care financing and health-care utilization patterns in two countries, Peru and Côte d'Ivoire. We will demonstrate that, despite the governments' best intentions (e.g. in Peru, the population has the constitutional right to obtain free medical care from the government), major parts of the population do not have access to modern medical care. Rationing of the limited health-services available takes place not through the price mechanism, but through geographical distribution and queuing.

In the subsequent chapters we explore this issue of non-price rationing to formally define and measure willingness-to-pay for medical care. We will estimate income and price elasticities for medical care and provide answers to the main questions listed above, including those about the effects of user fees on the poor, and the potential for raising revenues. But first, we will briefly summarize this chapter.

2.7 Summary

In this chapter we presented two broad reasons for the large role that governments play in the provision of medical care. The first is the strong correlation between development and health. The second set of reasons stem from certain characteristics of both health and medical care. For instance, viewing health as a basic human right explains why one does not want the market mechanism to be the only factor in the provision of medical care. Some of the characteristics of medical care (uncertainty of when and how much is needed, consumer ignorance, externalities, etc.), provide their own justifications for some form of government intervention or financing. Reducing the cost of medical care to the consumer puts the burden of financing care on the government. The severe budgetary constraints faced by many governments in LDCs have caused the results of government policies in the health-care sector to fall far short of expectations.

Medical care takes many forms and the economic arguments for government financing or subsidization are stronger for those types of medical care that are preventive in character than for curative care. Even for some types of preventive care, i.e. those types that directly benefit the specific client, the benefits of subsidization may not always exceed the economic costs. The case for subsidizing curative care, or providing curative care free of charge, is the weakest, at least on economic grounds. However, when good health and access to medical care are considered basic rights, the social benefits of providing medical care free of charge or at highly subsidized prices may well exceed the economic costs, provided, of course, that such policies indeed succeed in eliminating the access barriers to medical care.

In the next chapter we will investigate to what extent the provision of medical care at (close to) zero costs has succeeded in providing adequate medical care to those who need it, independent of their economic means. With this equity objective in mind, we will take a close look at the health-care sectors of Côte d'Ivoire, where medical care is provided free of charge, and of Peru, where we find a variety of health insurance schemes as well as large government subsidies for most types of medical care.

CHAPTER 3

The Health-Care Systems in Côte d'Ivoire and Peru

In the following chapters we will provide a detailed analysis of the demand for medical care in two countries. One in Africa, Côte d'Ivoire, and one in Latin America, Peru. This chapter will present socio-economic information that can serve as background for the subsequent empirical studies. Starting with Africa, we will present some key economic and health indicators and discuss the general organization of the Ivorian health-care system. The second half of this chapter provides the information for Peru.

3.1 Health and Health-Care in West Africa

Côte d'Ivoire is part of the West Africa region that is situated along the coast of the Atlantic Ocean. Liberia and Ghana are its neighbors on the west and east border, respectively, while Guinea-Bissau, Mali and Burkina Faso border the country in the north. Côte d'Ivoire has about 10 million inhabitants of which more than 60 percent live in rural areas.

This West-African region has some of the poorest countries in the world. Benin, Burkina Faso and Guinea-Bissau, to name just a few, all have per capita incomes of well below $300 per year. Health indicators for this region reflect this poverty. Life expectancies as low as 38.4 years are reported by Guinea, Guinea-Bissau and Sierra Leone (Table 1). Infant mortality rates exceed 150 per thousand for many of the countries in this region, and are as high as 175 in some countries. Child death rates range from 7.3 in the Cango to 43.5 in Guinea, Mali and Sierra Leone.

Other indicators sketch an equally bleak picture: For instance, most of the countries in this region do not produce enough food to match the daily

calorie intake requirements of the population. Primary school enrollment in six out of the 18 countries listed is well below 50% and the vast majority of the people have no access to clean drinking water.

The last three columns of this Table show basic indicators of the health service infrastructure of these countries. Perhaps the most striking fact here is that so little is known. For one third of the countries such simple measures as the population/physician ratio are not available. The data that are available show a large variation, part of which is likely to be the result of differences in definition. In those low income sub-Saharan countries for which there are data we find just over one doctor for every 40 thousand people, one nurse for every 3300 people and one hospital bed to serve 1700 people. For middle income sub-Saharan countries the numbers are somewhat better, especially with regard to physicians.

Though generalizations have a tendency to obscure rather than to enlighten facts, it seems fair to say that the health-care system in a typical country in West-Africa is badly developed. Indeed, the averages presented in Table 1 do not reveal some of the most serious deficiencies of the health-care systems, such as the skewed distribution of services in favor of urban areas and the poor quality of the services. This poor quality is evidenced by the lack of equipment in hospitals and the lack of drugs in clinics. In general the lack of a sound financial basis has dried up resources for anything but the salaries of the staff. (See Vogel, 1987, for a detailed description of health-care financing in four West-African countries; Senegal, Mali, Ghana and Côte d'Ivoire.)

In the next section we will take a closer look at the health-care system in one West-African country: Côte d'Ivoire.

TABLE 1: <u>Socio-economic Indicators, West Africa; selected countries</u>

	GNP per capita	Life exp. at birth	Infant Mortality Rate	Child Death Rate	% of Calory Require-ments	Primary School Enroll-ment	Access to Safe Drinking Water	Pop. per Physician (Thous.)	Pop. per Nurse (Thous.)	Pop. per Hospital (Thous.)
Gabon	4100	50.7	108.4	21.9	122.2	118.0	-	-	-	-
Congo	1140	56.9	77.8	7.3	109.2	-	25.0	-	-	-
Cameroon	800	54.5	92.0	10.4	87.5	108.0	-	-	-	-
Nigeria	730	49.6	110.4	21.4	85.7	-	-	12.0	3.0	1.6
<u>Côte d'Ivoire</u>	610	52.4	106.0	15.0	111.5	79.0	65.9	-	-	-
Liberia	470	49.9	128.0	23.2	102.5	76.0	-	9.4	3.2	-
Mauritania	450	46.2	133.0	25.2	97.5	37.0	84.0	-	-	-
Senegal	380	46.2	137.6	27.0	102.4	53.0	42.0	14.2	2.2	-
Ghana	350	52.9	94.8	11.3	65.9	79.0	47.0	39.2	3.3	1.7
Guinea	330	38.4	175.6	30.6	97.0	63.0	10.0	8.1	.8	.6
Sao Tome and Principle	330	64.1	60.9	-	96.8	-	80.0	2.8	.7	-
Cape Verde	320	64.1	70.2	12.6	88.9	131.0	50.0	6.3	1.0	.5
Sierra Leone	310	38.4	175.6	43.5	90.5	45.0	16.0	19.3	2.3	.9
Benin	270	49.0	116.0	18.6	82.9	67.0	20.0	17.0	1.7	1.0
Central African Rep.	260	48.6	138.0	27.2	90.6	77.0	-	23.1	2.1	.7
Togo	250	51.5	98.4	12.4	93.7	102.0	42.0	21.2	1.9	-
Guinea-Bissau	190	38.4	175.4	30.6	97.0	63.0	10.0	8.1	.8	.6
Niger	190	43.3	141.6	28.7	96.6	27.0	33.0	-	-	-
Burkina Faso	160	45.2	145.6	30.4	85.0	27.0	30.0	51.6	3.2	-
Mali	140	45.9	175.6	43.5	68.0	24.0	6.0	27.8	2.5	-
<u>Reference Groups</u>										
Low Income Sub-Saharan	219.9	48.2	128.5	25.7	90.0	60.1	25.2	39.2	3.3	1.7
Mid. Income Sub-Saharan	1025.3	51.0	103.2	17.6	94.2	98.5	45.8	11.3	2.6	1.4

Source: Social Indicators of Development, 1986; World Bank.

3.2 The Ivorian Health-Care System

Since independence (1960), the Côte d'Ivoire has seen a steady economic growth, from a level of $145 per capita in 1960 up to $1,207 in 1980, the high point of its economic development. This "miracle Ivorian" resulted from an energetic export-oriented economic policy that made Côte d'Ivoire the number of one world exporter of cocoa and number two in coffee (den Tuinder, 1978). The country's heavy reliance on these two export crops makes it vulnerable to large flunctuations in the commodity prices. After the boom in coffee and cocoa prices during the mid-seventies, the coffee price declined 31 percent and the price of cocoa 10 percent during 1977-78. The government tried to keep the economy in high gear by increasing public investment financed by heavy external borrowing.

The burgeoning external public debt made it clear that this policy could not be continued. A major financial recovery and structural adjustment program was initiated in 1981. Public investment was cut by 21 percent and in 1983 government current and capital expenditures were reduced by an additional 20 percent. The initial consequences for the economy were severe. Employment in the modern sector declined 31 percent between 1979 and 1984 (Newman and Lavy, 1987). Per capita private consumption declined about 35 percent in real terms during the same period. (Table 2)

Though the adjustment measures are beginning to have their intended effects, the short run outlook suggests at least a continued stagnation of the economy in terms of per capita GDP.

Against this background there is little room for major new government initiatives to improve the health-care infrastructure of the country. That

such an initiative is called for is evidenced by the current health status of the population and the status of the country's health-care infrastructure.

Table 2. **Macro Economic Indicators for Côte d'Ivoire**
Selected years, 1965-1984; (CFAF billion, 1984 constant prices)

	1965	1970	1975	1980	1981	1982	1983	1984
GDP	1059.4	1632.3	2225.2	3210.3	3248.1	3123.5	2991.0	2869.3
GDP, Per Capita (CFAx1000)	325.9	415.3	400.9	474.19	379.89	353.55	321.6	293.9
Government Expenditure	-	-	332.6	535.2	501.7	496.4	474.8	442.8
Government Expenditure as % of GNP	-		14.9	16.7	15.4	15.8	15.8	15.4

Since 1960, crude health indicators have improved significantly. The infant mortality rate decreased from 167 in 1960 to 119 in 1982, while life

Table 3. **Health Indicators for Côte d'Ivoire and Lower Middle Income Countries (averages)**

	Côte d'Ivoire 1960	Côte d'Ivoire 1980	Lower Middle Income 1960	Lower Middle Income 1980
Crude Death Rate	24	17	20	12
Infant Mortality Rate	167	119	114	89
Child Mortality Rate	40	23	28	13
Life Expectancy at Birth	39	47	45	56

SOURCE: The Côte d'Ivoire Country Economic Memorandum, the World Bank, 1986.

expectancy at birth increased from 39 to 47 years (Table 3). Still, these indicators are little better than those prevailing in neighboring West African countries which are much poorer, and they compare unfavorably to those of an "average" lower middle income country. Clearly, the development of health-care programs has lacked behind those in countries of similar levels of development.

Large differences of health status exist within the country. In Abidjan life expectancy was estimated at 56 years in 1979, compared with only 39 years in the rural Savanna regions, and 50 years in the urban Savanna regions. Child mortality rates in rural areas were twice as high as in Abidjan. Part of these differences is likely to be related to the unequal distribution of welfare in the Ivory Coast. Based on the value of total household consumption, only 3.3 percent of those in the lowest quintile live in Abidjan, while 45.7 percent of "the poor" live in the Savanna area (Table 4). Just 3.9 percent of "the rich" live in the Savanna, while 42.8 percent of them live in Abidjan. This large, urban-rural welfare gap is paralleled by the distribution of health care infrastructure.

Table 4. The Regional Distribution of Welfare in
Côte d'Ivoire Consumption Quintiles, Percentages of the Population

		QUINTILES				
	Total	1	2	3	4	5
Abidjan	18.8	[illegible].3	5.2	13.2	29.2	42.8
Other Cities	22.4	7.0	18.1	28.2	27.1	31.8
Rural East	24.7	35.2	35.4	22.5	19.9	10.6
Rural West	15.2	8.8	19.6	21.9	14.9	11.0
Rural Savanna	18.9	45.7	21.8	14.1	9.0	3.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

SOURCE: Glewwe (1987)

About 40 percent of the population in Côte d'Ivoire lives in urban areas. Abidjan alone accounts for a population of 1.6 million, or about 17 percent of the total of 9.3 million (1983). All major hospital facilities are in the cities. The two university hospitals (about 1300 beds in total) are situated in Abidjan, while the five regional hospitals (general hospitals with a capacity of about 275 beds) are found in the cities of Bouaké, Man, Daloa, Abengourou and Korogho. Together these hospital facilities account for 41 percent of all beds. Rural areas are served by small local hospitals, maternity and child care units, dispensaries and mobile health units.

The hospital sector employs 70 percent of all doctors, 45 percent of all midwives and over 50 percent of all nurses. About 60 percent of all doctors are based in Abidjan. The overall health manpower situation is unbalanced. In 1983 there were about 600 doctors, 2200 nurses and 1000 midwives, but virtually no skilled auxiliary workers. Given the current health manpower training system, the number of physicians will increase from

6.5 per 100,000 population in 1983 to 7.8 in 2000. The number of nurses per capita will increase from about 24.9 to 26.5. Thus, the already low nurse/doctor ratio of 3.8 will further decrease to about 3.4.

All health workers are paid by the government. Medical care is, in principle, provided free of charge, though some attempts are under way to introduce user fees for hospital care. However, only an estimated 3.1 percent of total health-care cost is currently covered by user fees (Vogel, 1987).

For 1984 the government health budget was 32.6 billion CFAF, or 6.8% of the total budget down from 7.5% five years earlier. More than 75 per cent of this budget is for personnel cost, about 8 percent for drugs and the rest for materials, equipment, maintenance and other operating cost. Manpower projections indicate that the total health budget will soon be insufficient just to cover personnel cost only, unless the health budget grows much faster than other parts of the government budget, or unless other financial resources are found.

The general quality of the existing facilities leaves much to be desired. A 1979 study showed that of the 309 dispensaries, one third was more than 20 years old, only 19 percent had piped in water and just 21 percent had a working water pump. Of the 126 Maternal-Child Health Care units (MCH), 45 percent had no water and 31 percent no electricity. The two university hospitals in Abidjan have occupancy rates well in excess of 100 percent, but many of the hospitalized patients are just waiting for the arrival of necessary drugs and other supplies and/or for the repair of equipment.

The most recent data on the population's health-status and health-care utilization patterns stem from the Côte d'Ivoire Living Standards Survey, conducted in 1985. In terms of self reported health status, about 30 percent

of the population suffers from an illness or injury during any given four week period (Table 5). No major sex differentials exist, but there is a distinct age profile. Young children (0-5) show an incidence of illness and injury equal to the overall average, while older children (6-15) show the

Table 5. **Percentage of Individuals who Report an Illness or Injury During the Past Four Weeks; by Location, Age and Sex**

	Abidjan			Other Cities			Villages			Côte d'Ivoire		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	30.73	35.22	33.19	30.26	29.93	30.10	32.08	30.05	31.15	31.48	30.98	31.26
6-15	21.99	20.05	20.98	23.03	20.60	21.84	20.63	19.89	20.28	21.43	20.98	20.27
16-35	26.41	32.93	29.86	27.06	31.57	29.70	23.97	26.81	25.61	25.58	29.40	27.69
36-49	40.80	40.32	40.56	44.80	44.59	44.69	46.08	42.27	43.70	44.60	42.40	43.32
50+	32.05	42.00	35.94	57.52	51.22	54.24	54.80	55.73	55.26	52.77	53.09	53.32
Total	27.81	30.79	29.36	30.37	30.77	30.57	30.99	31.21	31.11	30.26	31.03	30.67

lowest incidence rate. Adults (16 and over) show a monotonous increase of illness with age.

Table 5 reflects the anticipated decline in health associated with age: the number of days during which individuals are restricted in their daily activities, due to an illness or injury increases with age. The average number of days in rural areas during which the individual could not pursue his or her normal activities is 7.7 for males and 8.7 for females, compared with little over five days in urban areas. Thus, while the incidence of self-reported health problems appears to be higher in the cities, health problems are on average more severe in rural areas.

Table 6. **Average Number of Restricted Activity Days During the Past Four Weeks; by Location, Age and Sex**

	Abidjan			Other Cities			Villages			Ivory Coast		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	5.57	4.46	4.93	4.73	5.38	5.04	6.11	6.31	6.21	5.74	5.74	5.74
6-15	3.90	4.03	3.97	3.82	3.57	3.71	5.08	4.83	4.96	4.56	4.36	4.46
16-35	3.60	5.52	4.72	3.68	5.63	4.78	7.53	7.32	7.40	5.37	6.40	5.98
36-49	3.88	8.48	6.11	4.47	7.06	5.87	7.50	7.45	6.47	6.07	7.51	6.90
50+	8.36	10.29	9.24	10.17	7.73	8.97	10.97	12.47	11.71	10.66	11.53	11.09
Total	4.45	5.63	5.09	4.95	5.64	5.31	7.52	7.88	7.71	6.40	6.96	6.69

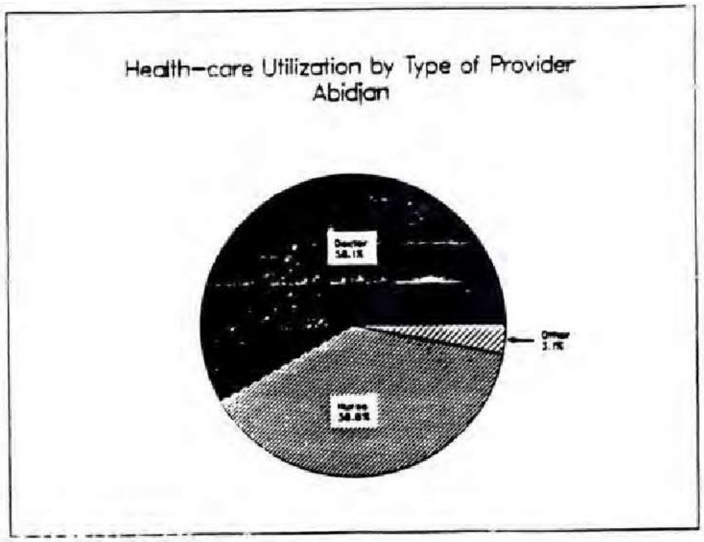
Table 6 shows the distribution of visits to formal health workers i.e. doctors, nurses and midwives. Since obstetric care is included in the table it is no surprise that prime age females usually obtain more medical care than prime age males. In the oldest cohort, where obstetric care is no longer relevant the reverse occurs: elderly females obtain less formal care than elderly males, with the exception of Abidjan. Although the elderly are less healthy than younger adults, they tend to consume less medical care, particularly in rural areas.

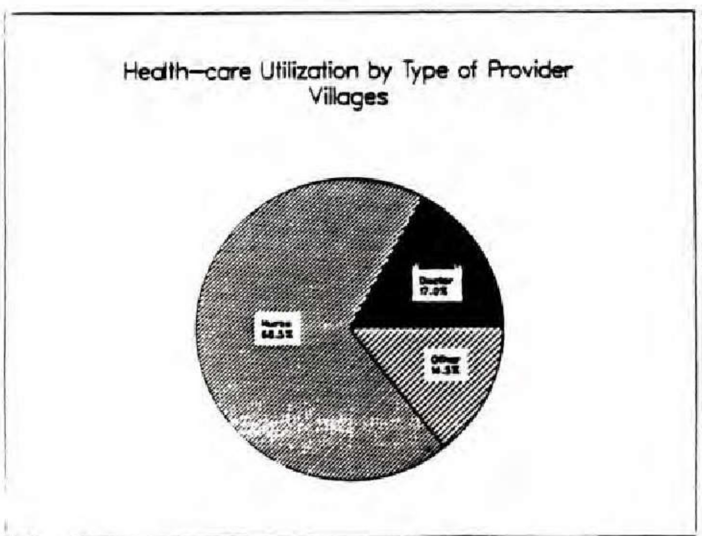
Perhaps the most important result in Table 7 is that in Abidjan 60% of the individuals who report an illness or injury obtain some form of medical care, while only 40% of those living in rural areas do. This quantitative difference in health-care utilization is aggravated by qualitative differences. Figure 1 show [illegible] 9.1% of the patients in Abidjan are treated by a physician and 38.8% by [illegible] In rural areas only 17.0% receive treatment from a physician, th[illegible] majority of the patients, 68.5%, see a nurse.

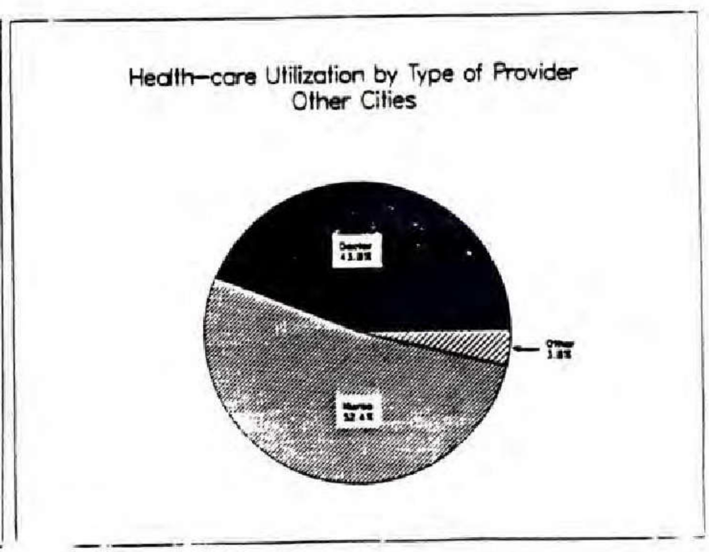
Table 7. **Percentage of Individuals with an Illness or Injury Who Obtained Medical Care**

	Abidjan			Other Cities			Villages			Ivory Coast		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Toral
0-5	68.25	68.97	68.67	69.57	60.25	65.00	46.26	41.91	44.36	54.36	51.44	52.99
6-15	50.68	61.64	56.16	50.45	52.08	51.21	41.94	40.85	41.43	45.60	47.64	46.56
16-35	53.95	62.20	58.72	53.85	57.49	55.89	39.59	47.33	44.27	47.52	53.88	51.26
36-49	60.78	68.00	64.36	62.50	59.09	60.66	45.39	38.89	41.46	52.42	47.29	49.48
50+	60.00	47.62	54.35	52.31	46.03	49.22	32.30	31.21	31.76	37.53	34.70	36.14
Total	57.45	63.54	60.77	57.05	55.63	56.32	40.59	40.10	40.33	47.30	47.95	47.64

FIGURE 1:


Health-care Utilization by Type of Provider
Abidjan


Health-care Utilization by Type of Provider
Villages


Health-care Utilization by Type of Provider
Other Cities

The data illustrate the severity of health problems in Côte d'Ivoire. Roughly one-third of the population is ill during any given 4-week recall period and, on average, those who are ill lose about one-quarter of their time due to illness. Health-care utilization is highly skewed in favor of urban dwellers, both in quantity and in qualitative terms. Just 40% of the ill in rural areas receive any type of medical care, most of this is provided by nurses, rather than physicians. Cost recovery is virtually nonexistent in Côte d'Ivoire, the health budget is shrinking as a percentage of the total government budget and the economic outlook for the country shows little if any per capita growth for the foreseeable future. Additional financial resources, other than general government revenues, need to be found, not just to maintain the current situation, but to make the major improvements that are necessary. Introducing user fees are one option. The desirability and feasibility of this option depend crucially on the willingness-to-pay for medical care, the main issue of this study. Our analytical work (Chapter 5), will focus on the determinants of health-care utilization in rural areas; on the basis of which we will estimate the willingness-to-pay for medical care. But first we will present a similar descriptive analyses of health and health-care utilization in Peru.

3.3 Health and Health-Care in Latin America

Peru, situated on the West-coast of the Latin-America continent is a country with a population of over 18 million people. With a *per capita* GNP of about $1000, the country is considerably better off than most of the West-African countries we briefly discussed above. As we show for selected countries in Table 8, this is generally true for Latin America: GNP *per capita* ranges from $1000 to $3410, i.e. well above the African figures, though Bolivia forms a poor exception with $540.

The health indicators are also well above those presented for Africa. (See World Health Organization, 1982, for a more extensive evaluation of health status in Latin American countries. See also Cox and Geletkanycz, 1977, for details on Peru). Life-expectancy in an average middle-income Latin American country is 65.6 years, as compared to 51.0 for a middle-income sub-Sahara country. The average infant mortality rate is 56.1 and the child death rate is 4.0. (Recall from Table 1 that these numbers are 103.2 and 17.6 for middle-income sub-Sahara countries). Primary school enrollment is about universal, but one-third of the population has still no access to safe drinking water.

TABLE 8: Socio-economic Indicators, Latin America; selected countries

	GNP per capita	Life exp. at birth	Infant Mortality Rate	Child Death Rate	% of Calory Require-ments	Primary School Enroll-Ment	Access to Safe Drinking Water	Pop. per Physician (Thous.)	Pop. per Nurse (Thous.)	Pop. per Hospital (Thous.)
Venezuela	3410	69.4	37.8	1.6	99.2	105.0	81.0	1.0	0.5	0.3
Argentina	2230	70.1	34.4	1.3	119.2	107.0	57.0	0.5	0.6	0.2
Uruguay	1980	73.3	28.8	0.9	99.1	109.0	80.0	0.5	0.7	0.2
Brazil	1720	64.1	67.8	5.5	106	102.0	71.0	1.3	1.2	0.3
Chile	1700	70.1	21.8	0.5	105.5	111.0	84.0	1.0	0.5	0.3
Colombia	1390	64.7	48.4	2.7	109.7	120.0	92.0	2.1	1.0	0.6
Paraguay	1240	65.8	43.8	2.2	121.7	103.0	21.0	1.4	0.7	0.7
Ecuador	1150	65	67.2	5.4	89.2	115.0	51.8	2.1	1.1	0.6
Peru	1000	59.3	94.6	11.2	85	116.0	51.0	1.7	0.9	0.5
Bolivia	540	52.5	118.4	19.5	81.8	87.0	37.0	2.0	2.7	0.5
Reference Group										
Mid-Income LAC	1782.8	65.6	56.1	4.3	109.3	107.3	66.3	1.3	1.2	0.4

Source: Social Indicators of Development, 1986; World Bank.

As for the health-care infrastructure, we find on average one physician for every 1300 people and about an equal number of nurses. There is one hospital bed for every 400 people.

Thus, both the health indicators and the data on the health-care infrastructure show a considerably better picture in Latin-America than in sub-Saharan Africa. Of course, this does not come as a surprise, since the countries in sub-Saharan Africa that we discussed belong to the poorest in the world, while most Latin-American countries are middle income countries. Nor does it imply that from a health and medical-care point of view Latin-America is in good shape in absolute terms. For instance, though the infant mortality rate has seen a steady decrease, its absolute value of 56.1 is well above the rates usually found in the industrialized world. Moreover, the greatest proportion of infant mortality is still due to communicable diseases. The Pan-American Health Organization reports that 24 percent of all deaths of children between age 1-4 in Latin America resulted from infectious and parasitic diseases that are preventable by immunization. (Pan-American Health Organization, 1982).

As for the health-care infrastructure, urban-rural inequalities in access to medical care are a major problem. For instance, in Colombia, an estimated six million people, half the population, do not have access to primary care (Zchock, 1979). And, in general, in the battle over the scarce financial resources available for medical care, urban hospital facilities have won over rural primary care facilities and preventive activities.

In the next section we will take a closer look at the health-care system and its financing mechanism in one Latin-American country: Peru.

3.4 The Peruvian Health-Care System*

The dynamics of Peru's economic growth during the last twenty years have been shaped by two completely different approaches to managing the economy: a period of nationalistic popular reforms from 1968 to 1975 followed by a period of stabilization, structural adjustment, and liberalization from 1975 to 1985.

During the first period, a self-proclaimed Revolutionary Government of the Armed Forces seized power and promised to implement drastic social reforms such as nationalization, agrarian reform, educational reform, worker participation in the management of firms (Comunidad Industrial), and promotion of cooperatives and "social property." It introduced subsidies for oil, gasoline, and basic staple foods; prices of other basic products were also controlled and/or heavily subsidized.

The second period began in 1975 with a coup d'état against the reformist military government. A group of more conservative militarists seized power and called for a return to a more orthodox management of the economy, with more reliance on the private sector. In an attempt to reduce government deficits and disequilibrium in the external sector, the new government drastically reduced subsidies and dismantled several social reforms of the first period. The government was committed to a program of stabilization and the reorientation of the economy toward a free-market strategy of growth. A new civilian government came to power in 1980. Without changing the basic orientation in the management of the economy this

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* This section draws heavily upon Suarez, 1987. We are very grateful to him for allowing us to incorporate his material in this volume.

government began consecutive drastic but unsuccessful stabilization programs. It also began a medium-term strategy of structural adjustment leading toward trade liberalization.

Data in Table 9 show the behavior of some of the macro-economic aggregates during the two periods. During the 1970-75 period of popular reforms, average yearly rate of gross domestic product (GDP) growth was 4.8 percent, slightly below the historically high rate of 5.5 percent a year in the fifties and sixties. With a population growth rate of 2.7 percent a year, per capita income increased at an average rate of 2.04 percent. Also during this period inflation rose from a historically low yearly rate of about 5 percent to 13 percent in 1975 and 30 percent in 1976.

During the 1975-85 adjustment and liberalization period, while the population growth rate declined to 2.6 percent, the average rate of GDP growth dropped to 1.23 percent a year; per capita income declined by an average yearly rate of 1.23 percent. Inflation sky rocketed from 30 percent during the mid-seventies, to 60 percent in 1980, 110 percent in 1984, and 170 percent in 1985. Economic recession was particularly severe during the last five years of the structural adjustment and trade liberalization programs.

Between 1980 and 1985 the economy remained almost stagnant; GDP fell at a rate of 0.7 percent a year, and per capita income declined even faster at 3.4 percent a year. In 1985 income per capita was about 6 percent lower than at the beginning of the seventies.

TABLE 9. **Peru: Gross Domestic Product, Inflation, Population, Per Capita Income, 1970, 1975, and 1980-85**

	1970	1975	1980	1981	1982	1983	1984	1985
Real GDP, (bill. 1980 US$)	6.2	12.2	14.5	16.7	14.4	11.1	10.0	14.2
Rate of growth (p.a. real terms)	5.0	-0.5	0.1	3.1	0.6	-12.5	4.4	1.9
Inflation rate	5.0	13.0	59.2	75.4	64.4	111.2	110.2	169.9
Population (millions)	12.8	14.6	16.6	17.0	17.4	17.9	18.4	18.9
Income Index (1970=100) (real terms)	100.0	110.7	113.9	114.6	112.8	95.9	97.4	96.7

Source: Suarez, 1987.

During the first phase of the military government, after two years of austerity measures and policy reforms (1969-70), the government pursued expansionary fiscal policies. Government expenditures, as a proportion of the GDP, increased from an average of 16-18 percent during previous years to above 20 percent during the early eighties, Table 10. Revenues did not increase in proportion, and domestic and foreign borrowing were heavily used to finance rising government deficits.

TABLE 10. Peru: Public Sector Finances, 1970, 1975, 1980-85
(millions of intis)

	1970	1975	1980	1981	1982	1983	1984	1985
Central Government								
Total Expenditure	42.1	106.7	1046.7	1830.2	2634.0	6048.0	10728.3	23869.0
Total Revenue	38.8	88.6	1008.4	1509.7	[illegible]59.6	3732.0	5228.1	21667.0
Deficit	-3.3	-18.1	-38.3	-320.5	-174.4	-2316.0	-5500.2	-2202.0
Total Government								
Expend/GDP (%)	17.5	19.4	21.1	22.1	19.1	23.9	18.8	15.4
Deficit/GDP (%)	-1.4	-3.3	-0.8	-3.9	-1.3	-9.1	-9.6	-1.4

Source: Suarez, 1987.

Government deficits, around 3-4 percent of GDP between 1971 and 1974, increased to 6 percent in 1976 and 7.5 percent in 1977. At this time the government attempted to control government expenditures. Favorable export prices, resulting in additional export tax earnings, were used in part to balance the budget. Thus government deficits, as a proportion of GDP, were reduced to 4.7 percent in 1978, 0.5 percent in 1979, and 0.8 percent in 1980.

During the eighties, amidst a process of structural adjustment and liberalization, inconsistent expansionary fiscal and monetary policies were pursued. From 1980 to 1984 high government expenditures continued; in 1984 total government expenditures represented almost 24 percent of GDP. An unsuccessful reform of the tax system and the economic recession resulting from falling terms of trade led to a drastic reduction of government revenues. Deficits rose sharply from 2.8 percent of GDP in 1980 to more than 9 percent in 1983 and 1984.

Increases in government expenditures have not been uniform for all government functions. Between 1973 and 1981 the most important changes were reductions in the share of government expenditures on such social programs as health, education, housing and community activities. Expenditures for these social programs declined from approximately one-third of the total budget in 1973-75, to less than one-fifth in 1981. In 1981 a single item--other purposes--absorbed the largest proportion of total government expenditures. This item comprises mainly the interest and amortization payments on domestic and foreign public debt. Debt-related payments increased from 10 percent of government expenditures in 1973 to 21 percent in 1981. Estimates for 1984/85 show that these payments represented 25-27 percent of total government expenditures.

Thus, the overall picture of the eighties is that of a government struggling to stabilize the economy. The budgetary pressures are such that expansion of the outlays for the social sectors is virtually out of the question. Return of the economy to the path of sustained economic growth, so illusive during the eighties, is still no in sight.

The implications of these developments for the health-care sector could be severe. Despite major progress during the past decades, much remained to be done to improve the health-status of the population. Table 11 summarizes the evolving pattern of the mortality, life expectancy, and infant mortality rates from selected years from the fifties to 1986. In 1986 average life expectancy at birth is estimated at 60.8 years, which is below the average life expectancy rate of 61.2 years for other Latin American countries and the average of 71 years for the developed countries.

TABLE 11. **Peru: Evolution of Health Status Indicators, Selected Periods (per thousand)**

	1950-55	1975	1980-85	1986
Crude Birth Rate	47.0	39.4	37.0	35.0
Crude Mortality Rate	21.6	12.2	11.7	9.7
Infant Mortality Rate (a)	156.0	106.6	99.0	90.5
Fertility Rate (b)		5.6	4.9	4.7
Life Expectancy at Birth	44.1	56.5	58.9	60.8

(a) Live birth, up to one year.
(b) Per woman in child bearing age.

Source: Suarez, 1987.

As in most developing countries, the evolution of the life expectancy shows that after a significant increase in life expectancy during the fifties and sixties, the rate of increase leveled off during the last decade. Cumulative increases in life expectancy declined from 13 percent between 1960 and 1970 to less than 5 percent during the last ten years (1975-85). For developed countries life expectancy leveled only after it reached 70 years.

Data also show that whereas both birth and mortality rates have been declining, infant mortality remains high, which is the most important factor explaining the relatively low life expectancy and still high crude mortality rates. Peru's infant mortality rate is about 90 per thousand; it is one of the highest among Latin American countries and is in sharp contrast to the infant mortality rates of the most developed countries, whose rates range from 10 to 20 per thousand.

Given the overall economic outlook, it is unlikely that much improvement in these health indicators can be expected to result from the overall improvement of living conditions that is associated with economic growth. Rather, increased efforts in the provision of medical care are called for, if not to increase the health status of the population then, at least, to protect current levels from the detrimental effects of a further decline in the economy.

Again, the major question is where to find the resources necessary to pay for maintaining and, indeed, improving the current health-care system? Currently, the Peruvian health system is a combination of programs and institutions from government and non-government organizations. The public health-sector, comprising all institutions providing both preventive and curative health services to the general public, has 116 hospitals, 463 health-centers and 1,405 sanitary posts (1983-84, Table 12). Though access to these services is generally free of charge, the regional availability and other forms of non-price rationing (e.g. space availability) effectively reduces the coverage to an estimated 56 percent of the population.

The corporate sector (mainly social security funds, army, police, state owned firms and agricultural cooperatives) covers about 16 percent of the population, while the private sector, with an equal number of hospitals as the public sector, covers just 1.8 percent.

TABLE 12. **Peruvian Health Institutions and Coverage (1983-84)**

	Hospitals	Health Centers	Sanitary Posts	Other	% Pop. Covered
Public Health Sector	116	463	1405	13	56.5
Corporate Sector	98	149	130	0	16.6
Private Sector	116	18	3	4	1.8
Total	330	630	1538	17	74.9

Source: Suarez, 1987.

Although most policy debates on financing health programs concentrate on financing the public health sector, this sector's expenditures represent only about 10 percent of total health expenditures (Table 13). Expenditures of the corporate health sector and private households on health-related goods and services represent about 90 percent of total expenditures. These results show a further need to explore the role that the corporate and private sectors could have in implementing health programs.

TABLE 13. **Composition of Health Expenditures in Peru (around 1980-84)**

Sectors	Coverage	Expenditure US$ per capita	Total Expenditure % of the GDP	Sectorial Share (%)
Public Health Sector	56.5	10 to 17	0.6 to 0.8	10
Corporate Health Sector	16.6	100 to 130	2.3 to 3.1	45
Private Sector	1.8	11 to 20	2.1 to 3.5	45
TOTAL	100.0	55 to 77	5.0 to 7.0	100

Source: Suárez, 1987.

Still, more than half of the population has to rely on public health services, not counting the estimated 25% of the population that has effectively no access to any form of medical care.

The latter is a direct result of the skewed geographical distribution of health-care facilities. Hospitals are heavily concentrated in the metropolitan area and other major cities. Health centers and health posts are better distributed but shortages are still evident, especially in the more remote rural areas (Carrille, 1986). Moreover, health facilities in rural areas show a high degree of deterioration. For instance, in the Cuzco and Cajamarca regions health facilities function at less than 50 percent of their capacity due to deteriorated equipment, while 80 percent of the health posts do not have water and sewage facilities (op cit., p.19).

The skewed distribution of health-care facilities mimics the overall distribution of welfare. Average per capita income in Lima was 770 intis per month in 1985/86, but less than half of that in the rural Sierra area (Table 14). Only 6 percent of the poor live in the metropolitan area, and over 50 percent live in rural Sierra, though both areas have approximately the same population.

TABLE 14. **The Distribution of Households by Quintiles**
(percentages)

Characteristics	All Peru	Quintile (Lowest) 1	Quintile 2	Quintile 3	Quintile 4	Quintile (Highest) 5	Mean Expenditure Per Capita (Intis per month)
Region							
Lima	26.8	6.0	18.2	28.8	35.4	45.5	770.9
Coastal Urban	15.2	11.1	14.7	17.6	15.4	17.2	569.8
Coastal Rural	7.2	8.8	9.8	7.2	6.8	3.5	421.3
Sierra Urban	11.0	9.0	9.6	10.2	11.5	14.8	649.9
Sierra Rural	30.5	52.8	38.5	28.1	22.9	10.4	366.8
Selva Urban	3.0	2.1	2.8	2.3	3.0	4.7	792.0
Selva Rural	6.3	10.3	6.5	5.8	3.9	413.5	
	100.0	100.0	100.0	100.0	100.0		

Source: Glewwe, 1987.

TABLE 15. **Percentage of Individuals with an Illness or Injury in Peru; by Location, Age and Sex**

	LIMA METRO			OTHER URBAN			RURAL			PERU		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	62.23	64.06	63.16	49.53	50.59	50.05	41.67	42.57	42.10	47.61	49.17	48.37
6-15	40.36	45.18	42.71	30.85	33.12	31.97	29.57	32.40	30.95	32.41	35.52	33.93
16-35	40.13	47.64	44.01	32.80	39.52	36.28	32.13	36.45	34.35	34.88	40.94	38.01
36-49	47.15	60.31	54.22	40.68	52.03	46.53	41.42	53.51	47.50	42.74	55.09	49.11
50+	51.68	62.84	57.46	46.35	63.97	55.46	57.61	65.49	61.88	53.25	64.42	59.02
Total	45.36	53.01	49.27	37.45	44.19	40.48	38.00	42.96	40.48	39.76	45.98	42.89

TABLE 16. **Average Number of Restricted Activity Days During the Past Four Weeks; by Location, Age and Sex**

	LIMA METRO			OTHER URBAN			RURAL			PERU		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	2.12	1.80	1.95	2.50	2.30	2.40	3.12	2.96	3.04	2.70	2.47	2.58
6-15	1.62	1.09	1.35	1.32	1.40	1.36	2.01	1.98	1.99	1.72	1.57	1.64
16-35	1.38	1.26	1.31	1.87	1.64	1.74	2.31	2.10	2.20	1.85	1.66	1.74
36-49	1.70	1.86	1.80	1.84	1.66	1.76	2.85	2.59	2.70	2.27	2.13	2.19
50+	1.64	3.06	2.44	2.42	3.47	3.05	3.98	3.46	3.70	3.06	3.36	3.23
Total	1.64	1.70	1.67	1.96	2.05	2.01	2.84	2.62	2.72	2.26	2.18	2.28

Table 15 and 16 show the percentage of people who report an illness or injury and the number of restricted days of those who are ill, respectively. The patterns are similar to those in Côte d'Ivoire: the

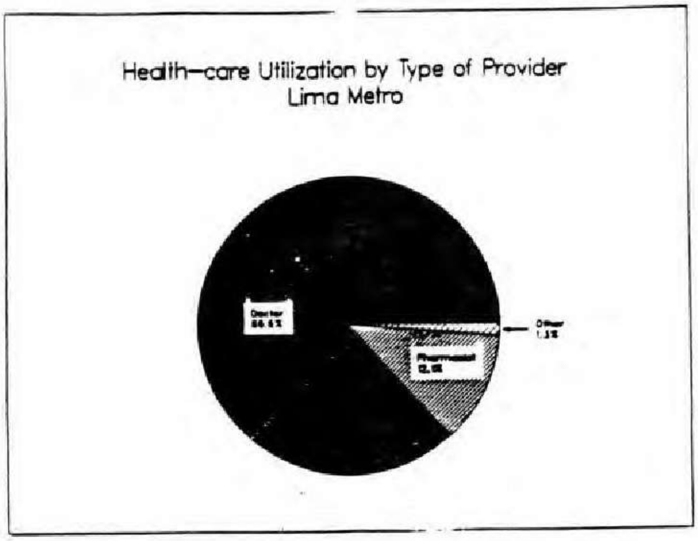
incidence is higher in urban areas, but the severity of il ess is higher in rural areas.

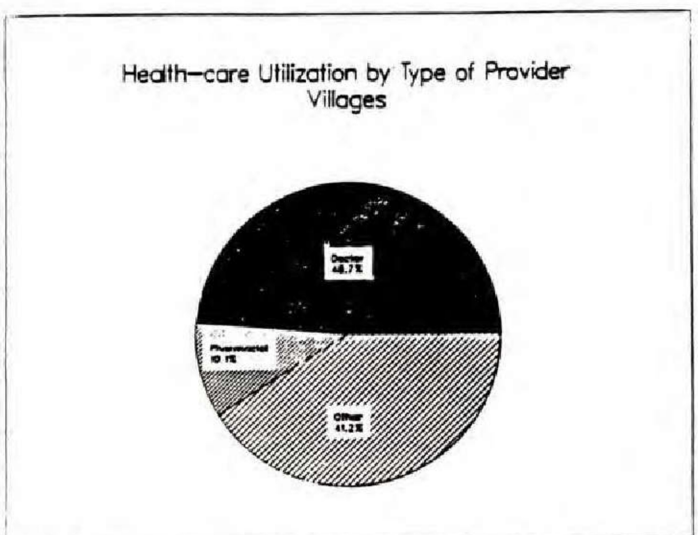
Almost half of the ill or injured in Lima receive some form of medical care, but the number for rural areas is less than 30 percent (Table 17). This quantitative differential is aggrevated by qualitative differénces. Over 85 percent of medical care in Lima is provided by doctors. In the rural villages less than half of the patients receive their medical care from a physician, 10 percent receive it from a pharmacist, while 48 percent obtain care from a doctor (Figure 2).

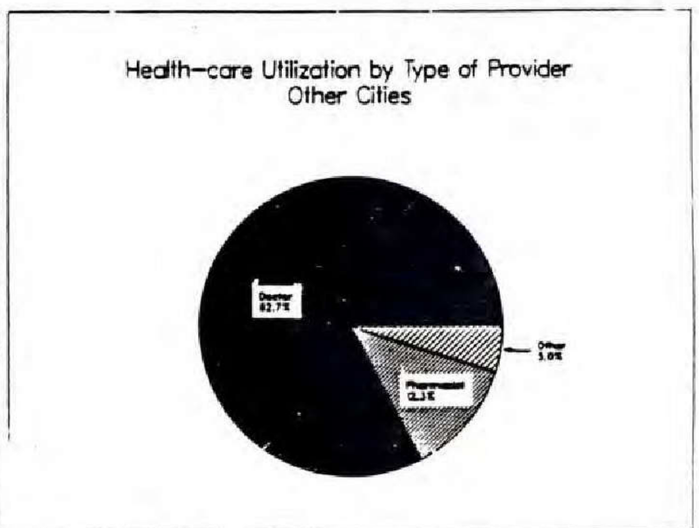
TABLE 17. **Percentage of Ill Individuals Who Obtained Medical Care; by Location, Age and Sex**

	LIMA METRO			OTHER URBAN			RURAL			PERU		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	58.76	56.83	57.76	53.38	53.67	53.52	31.31	29.74	30.55	44.01	43.46	43.73
6-15	49.25	36.52	42.69	32.90	38.49	35.74	26.05	21.70	23.82	34.50	30.34	32.37
16-35	46.96	44.02	45.32	45.53	45.91	45.74	30.90	29.29	30.02	40.83	39.50	40.09
36-49	43.00	54.40	49.81	52.51	50.62	51.42	33.02	34.37	33.78	40.88	44.79	43.14
50+	53.48	55.48	54.61	51.23	47.00	48.71	32.93	30.20	31.43	42.05	40.77	41.33
Total	49.90	48.05	48.88	46.00	46.62	46.34	30.61	28.79	29.64	40.25	39.40	39.79

FIGURE 2:


Health-care Utilization by Type of Provider
Lima Metro


Health-care Utilization by Type of Provider
Villages


Health-care Utilization by Type of Provider
Other Cities

In sum, the evidence calls for major improvements in the Peruvian health-care system, especially in rural areas. At the same time, the overall economic outlook calls into question the future availability of government resources to make those improvements. The large urban/rural differentials suggest that there is room for redistributional policies to partly improve the rural health-care system. The introduction of user fees may be another option.

3.5. Summary

In this chapter we discussed the health-care systems in two countries, Côte d'Ivoire and Peru, against the background of the overall macro-economic situation. The two countries are very different and are situated in vastly different continents. Still, a number of similarities emerged that are relevant to this study. First, both countries pursued a health-care policy in which the government provides medical care free-of-charge. In Peru, the corporate and private sector complement the public sector in urban areas, but in rural areas the population still has to rely merely on government provided services.

Second, the economic situation in both countries puts sever constraints on the government budget, making it all but impossible to increase the health budget in order to provide additional resources for expanding the medical system. Third, most public services accrue to the better-off urban dwellers, while the rural population has limited access to public facilities. Moreover the quality of these facilities leaves much to be desired.

All evidence makes it painfully obvious that additional resources are necessary to provide medical care of sufficient quality to rural areas. Resources that can not be found in the government's budget. Are user fees the answer? For urban areas, or - more precisely - for better-off households in urban area, the answer to this question seems clear. There are no clear theoretical arguments in favor of across the board subsidies for curative care. Given the very limited resources available to provide medical care, it makes sense to charge those consumers that can afford it for medical goods and

services provided by the government, especially for curative care. Public resources thus saved could be used to help upgrade rural health-care facilities and subsidize care for the rural poor. But should user fees also be charged in rural areas for primary care facilities? In the rest of this book we will try to answer this question, based on detailed empirical analyses of the general health-care utilization patterns presented in this chapter. In the next chapter we will first make the issues related to health-care financing more precise and then present the general theoretical framework on which the empirical analysis will be based.

CHAPTER 4

Analytical Issues in Health-Care Financing

4.1. Introduction

As became clear in the previous chapters, health-care systems in the developing world face a multitude of problems that can not be solved overnight. Many of these problems will not be discussed at any length in this volume. They include questions related to the overall "optimal" outlay for medical care - as compared to, say, expenditures for education or railroads - the appropriate mix of public and private expenditures for medical care, the apparent need to shift resources from curative to preventive care, the desired curricula for health workers, the balance of payments implications of drug imports, etc. High on the list of major problems that urgently need to be dealt with is the question of how to finance medical care. How can sufficient resources be generated to maintain a health-care system of acceptable quality, without putting up financial barriers that deny access to the system to all but the richer few? This is the issue that we address in the rest of this volume, with a focus on curative primary care in rural areas.

This chapter discusses how various aspects of this problem can be approached analytically. Section 2 discusses options for resource mobilization and especially the pro's and cons of introducing prices (user fees) into the system. We will show, in general terms, how the issues of equity and efficiency that are implicit in these options can be addressed empirically if we improve our knowledge of the determinants of the demand for medical care, especially regarding the effects of income and prices.

Section 3 formalizes this discussion. It introduces the general framework used by economists to conduct the type of welfare economics that is called for, provides a formal definition of the willingness-to-pay for medical care and shows how - armed with a properly specified model of the demand for medical care - we can answer such questions as how much revenues can be raised or who wins/loses under various policy scenario's. The theoretical apparatus thus developed will be applied in the following chapters to empirically address these issues using data from Peru and Côte d'Ivoire.

4.2. Alternative Options For Health-care Financing

In the previous chapter we showed the dismal state of the health-care systems in two developing countries, Côte d'Ivoire and Peru. We argued that, in general, the way in which these countries finance their health-care systems has contributed to the problems. In this respect these two countries are not exceptional. The World Bank Policy Study on Financing Health Services in Developing Countries states:

> "Problems in the health sector in developing countries can be summarized under three headings; allocation-insufficient spending on cost-effective health programs; internal efficiency-wasteful public programs of poor quality; and inequity-inequitable distribution of health services" (World Bank, 1987, p.13)

The fundamental cause of these problems is identified as "poor approaches to financing". As we have seen, the vast majority of financial resources for health services comes from government revenues or other general funds (such as social security plans), (see also Jimenez, 1987; Katz, 1987). Only a tiny fraction of the cost is recovered from direct payments by the

consumers. If one could increase count on sustained economic growth, a rapid increase in the government budget for health-care may help to sustain the current health-care infrastructure, to make the necessary quality improvements and to expand the system to meet the needs of the growing and aging population. However, the economic outlook of most developing countries show sluggish growth at best, while the global reevaluation of the role of governments in the process of economic development calls for less rather than for more government expenditures.

Thus, the question is not whether additional resources, other than government revenues, need to be found to strengthen the financial basics of the health-care system, but where and how. When government funds are insufficient to provide medical care for those in need, there is only one alternative: charge the consumer.

This dichotomy between government financed medical care and user charges is somewhat artificial. First of all, the government needs revenues to cover its expenditures, revenues it obtains by taxing the citizens. The inequities of the various tax systems in developing countries (as well as in the industrialized world) warrant a study of their own, but this is beyond the scope of this volume. Secondly, consumer's can pay for the goods and services in various ways, either directly at the time of consumption, or through pre-paid private insurance or compulsory public insurance schemes. If in the latter case health-care is provided free of charge, the difference to the consumer, between government financed and privately paid (but fully insured) medical care is negligible. Indeed such a system is likely to suffer from many of the same problems that characterize a government financed system. Though, of course, in the fully insured health system prices can still play a role, for instance as incentives to the provider to improve efficiency.

In sum, there is a continuum from a system that is completely financed by the government, and in which prices do not play any role, to a completely market oriented system in which prices are used by consumers and producers to allocate the scarce resources available for medical care. We will use the fully government funded health-care system as an extreme case and compare it with one in which additional revenues are raised through user charges.

As stated in Chapter 1, this study is not concerned with the effect of prices on the suppliers of medical care; our focus is on the effects of prices on the consumer. Money prices faced by the consumer can be changed by increasing or decreasing government subsidies or by altering the insurance coverage. But, as we will argue below, money prices are not the only relevant cost to the consumer; other private costs - such as travel cost and lost time for traveling and waiting - also are important.

The main question we will try to answer in the next chapters is: are user fees a viable alternative to government revenues for financing medical care? The answer to this question depends ultimately on the weights one attaches to the equity and efficiency consequences of introducing user fees. These weights reflect the government's preferences or social welfare function. It is unlikely that they can be determined empirically with reasonable precision. What can be determined empirically is what is likely to happen, both in terms of equity and efficiency, if a policy is implemented that introduces user fees or reduces subsidies in a system that previously provided medical care free of charge (or at highly subsidized prices).

The first set of questions that need to be answered is: how do demand patterns change as a result of such a policy? Will people make more/less use of certain health-care providers? Who will opt out of the system, either by not consuming medical care at all or by substituting away from the public system to private providers?

The second set of questions pertains to the welfare consequences of the policies (again, from the consumer's point of view). Who's welfare will be increased/decreased by the fee policies? Are the poor being more/less effected than the rich? Are these options to off-set the negative welfare effects?

Finally we need to address the resource mobilization question. Since, the proposal to raise user fees is motivated by the general lack of financial resources for the health-care system, the question arises whether those fees can be set high enough to raise the revenues necessary for improving the health-care system.

The answer to all these questions depend ultimately on the consumers' reactions to such policies. To be more precise, if prices are irrelevant for the consumption of medical care, i.e. if patients demand medical care only on the basis of their medical needs, irrespective of the economic costs, it makes imminent sense to set the fees equal to their marginal costs. In that case one can obtain full cost recovery without welfare implications. This, of course, is an unrealistic example. Consumers are sensitive to prices, even in the case of medical care (that is exactly why medical care is provided free of charge or as subsidized prices).

Thus the questions boil down to how sensitive consumers are to price changes, how this differs for households in different income groups and which

other determinants of the demand for medical care are important and can, perhaps, be used to off-set some of the negative effects.

In the next section we will show how the economic tools of demand and welfare analyses can be used to answer these questions empirically.

4.3. The Welfare Analyses Of Health-care Demand

The starting point for an economic welfare analysis is a decision making unit that, given limited resources and other constraints, tries to maximize it's own welfare. This welfare maximizing unit is usually an individual or a household, but the general theory can equally well be applied to a government, a firm or a hospital. If the unit is a firm "welfare" could be equated to "profits", which are observable. In that case, the decision problem boils down to one of profit maximization. If the unit is a household or individual, welfare is less easily defined. Indeed analysts make do with a vague notion of welfare, or "utility", that is not measurable but is assumed to be derived from the consumption of goods and services. In its most general form "goods and services " can include leisure or savings but also such intangibles as good health. Consequently the empirical counterpart of this theoretical frame work is the consumption of a bundle of goods and services that either directly contributes to welfare, or indirectly, for instance because they contribute to good health which in turn contributes to welfare.

Thus, households are assumed to choose the bundle of goods and services that maximizes their welfare. The constraint they face is their command over limited resources. Furthermore, they are guided in their choices by the relative prices of the goods and services under consideration. The

analyst observes the household's consumption behavior, the household's total income and the prices in the market. Given the theoretical welfare maximizing framework, these data suffice to make inference on the relative levels of well-being of the households and thus on how these welfare levels change under various policy scenario's. These policy scenario's usually take the form of a change in relative prices or a change in income. We will show below that, prices should be interpreted broadly to include, for instance, the cost of time spent to obtain the good. But first we will formalize this general framework for welfare analyzes.

We will denote a vector of K goods and services as $x = (x_1, x_2, \ldots, x_k)$. Their respective prices are $p = (p_1, p_2, \ldots, p_K)$, and a household's total income is Y. Households are assumed to maximize a utility function U, defined over a bundle of goods and services x, when prices are p and income is Y. In formula:

$$\max_x U = U(x_1, x_2, \ldots x_K) \qquad (1)$$

$$\text{subject to } Y = \sum_{i=1}^{K} p_i x_i$$

The budget constraint says that total expenditures cannot exceed total income.

The result of this maximization problem is the bundle of goods and services chosen by the household. The amounts consumed of each item depend in general on income and all prices. This set of demand equations can be written as follows:

$$x_1^0 = x_1(Y, p_1, p_2, \ldots, p_K)$$

$$\vdots$$

$$x_i^0 = x_i(Y, p_1, p_2, \ldots, p_K) \qquad (2)$$

$$\vdots$$

$$x_K^0 = x_K(Y, p_1, p_2, \ldots, p_K)$$

where x_i^0 denotes the optimal quantity of consumption item i.

Substituting (2) into the utility function (1) yields a so-called indirect utility function:

$$U^0 = U^0\ (Y, p_1, p_2, \ldots p_K) \qquad (3)$$

This function shows the maximum welfare level, U^0, that can be reached with income Y, when prices are p. The most useful tool for welfare analyses is the inverse of this function:

$$Y = C(U^0, p_1, p_2, \ldots, p_k). \qquad (4)$$

This function, called a cost function, shows how much income is needed, Y, to obtain a given welfare level, U^0, when prices are p.

Since this cost function answers the question of <u>how much</u> does it cost (how much income is needed) to obtain a given welfare level when prices are, say, p^0, it can also show <u>how much more</u> it will cost if we raise prices to p^1. Thus, with the use of equation (4) we can calculate the additional income a household needs to stay at the same welfare level when prices move

from p^0 to p^1. This amount is in the economic literature known as the <u>compensating variation</u> (e.g. Deaton and Muellbauer, 1980).

Let us compare two situations, the only difference between the two is a change in the price of good i, from p_i^0 to p_i^1. Before the price change the cost function reads

$$Y^0 = C(U^0, p_1, p_2, \ldots, p_i^0, \ldots, p_K) \tag{5}$$

after the price change we have

$$Y^1 = C(U^0, p_1, p_2, \ldots, p_i^1, \ldots, p_K) \tag{6}$$

In order to compensate a household for the welfare loss incurred by raising one of the prices, we need to pay the household the amount of $(Y^1 - Y^0)$ the compensation variation. We will now show how this theoretical framework can be used to address the main questions of this study.

Let p_f be the fee for obtaining medical care and p_t be the sum of all other costs (travel time, waiting time, travel costs, etc.), then

$$p_m = p_f + p_t \tag{7}$$

where p_m is the total costs of medical care.

Equation (7), simple as it is , will play a major role in our subsequent analyses. First of all, as we will show in Chapter 5, it will allow us to obtain price elasticities for medical care even when p_f, the user fee, is zero. Secondly, it will allow us to address such questions as: if we

increase the fee for care, p_f, how can we compensate for the corresponding welfare loss (e.g. by reducing various aspects of p_t)? The issue of welfare compensation will be addressed with the help of equation (4), the cost function.

If p_i^0 in equation (7) represents the total cost for medical care, i.e. the sum of the fee p_f and the private costs p_t, and p_i^1 in equation (6) is the new total cost, resulting form the reduction in p_t and and increase in p_f, then $(Y^1 - Y^0)$ is the amount of money that leaves the household equally well-off in both situations. In other words, the compensating variation $(Y^1 - Y^0)$ is the maximum amount a household is willing to pay for the improved access (e.g. reduced travel time) to a clinic or hospital.

This <u>willingness-to-pay</u> notion is exactly what is needed to discuss the welfare effects and revenue potential of introducing (or increasing) user fees for social services. It should be sharply distinguished for someone's <u>ability-to-pay</u>. This latter notion is sometimes used in reference to the consumption of other goods, mostly luxuries such as alcohol or theatre tickets. As long as someone's expenditures on such luxuries exceed the expected costs of medical care, it is judged that he or she is able to pay for medical care.

Unfortunately, someone's <u>ability</u> to pay is only relevant for policy evaluations if one can coerce the person into consuming the goods or services. In the more common situation where one has to rely on people's <u>choices</u>, we can infer from observed consumption patterns whether one is <u>willing</u> to pay for the goods or services.

This completes the theoretical framework necessary to formally address some of the issues discussed in the previous section. The empirical

work starts with the observation of these consumption patterns, i.e. with the estimation of the system of demand equations given in (2). Of course, many factors other than income and prices influence the demand for goods and services. For instance, if the analyses take place at the household level, the size of the household needs to be taken into account. Or, if the focus of the analysis is on any specific item (such as medical care), factors such as education, sex or the age of the individual will play a role. If we denote all such intervening variables by $h=(h_1,h_2,...,h_L)$, we can write the vector of demand equations as:

$$x = x(Y,p;h) \tag{8}$$

This system of demand equations can be estimated from household survey data, provided that sufficient variation in the price vector p is observed. That is often not the case. However, as stated above, prices should be interpreted broadly; the cost of obtaining medical care is not only the fee to be paid to the doctor, but also includes the time and cost of traveling to the clinic or hospital as well. These private costs are specific to the household or the individual. Thus, even when money prices (fees) are the same for all individuals, the total cost of obtaining care is likely to vary. It is this variation in the individual cost of obtaining medical care that allows us to estimate price responses even if money prices (fees) are zero. Subsequently, the price responses will allow us to perform the necessary welfare analysis, as outlined above.

4.4. Summary

This chapter provided a brief introduction to the economic tools necessary to answer questions related to the effect of user fees on the demand for medical care and the subsequent welfare and budgetary implications. The theoretical framework provided a precise definition of the willingness-to-pay for medical care. We argued that willingness-to-pay and not ability-to-pay is the appropriate criterion to judge the feasibility and desirability of alternative pricing policies.

The theoretical framework also serves as a guide for the subsequent empirical work. First, using observations on current consumption patterns of medical care, demand equations need to be estimated to quantify the influence of such variables as income, price (including travel time, etc.), education, family size, etc. Secondly, on the basis of these demand equations, price elasticities can be calculated that show how price sensitive consumers are, and how this price sensitivity differs among various consumer groups. Finally, armed with this empirical evidence, the tools of welfare economics can be used to quantify the welfare and budgetary implications of various policy scenarios.

In Chapters 6 and 7 we will systemmatically go through these three stages of empirical work. But first we will further specify the analytical framework in order to make it more suitable for studying the determinants of the demand for medical care. Our starting point is the literature on health economics, especially as it focusses on the role of income and prices.

CHAPTER 5

Modeling the Demand for Medical Care

5.1 Introduction

As discussed in Chapter IV, evaluation of the feasibility and desirability of a user fee plan requires an *ex ante* evaluation of the utilization, revenue, and welfare consequences. This, in turn, requires knowledge of the properties of the demand function, especially price elasticities and the effects of other non-monetary costs such as travel time. The price elasticities provide information about how user fees will affect utilization and revenues. Travel time effects can be used to measure the amount individuals are willing to pay for improved access (reduced travel time). If governments open new social service facilities in rural areas, (thus making people better-off by improving access), then the willingness-to-pay is the maximum price increase that can be charged for these facilities without making individuals worse off.

The usually straight-forward exercise of demand estimation is greatly complicated for the case of health care by the fact that there is often little or no price variation within a country. In many developing countries the vast majority of medical services are run by governments who set prices close, and in many cases equal to zero. Even when prices are positive, they are typically uniform within the country. A second complication in modeling the demand for medical care is that the decision to use services is discrete. For example, individuals choose whether to visit a clinic, hospital, private doctor or not to obtain care at all (i.e. treat themselves). A third issue, and one that is not restricted to medical care, is that the effects of user

fees are likely to vary by income so that the distributional consequences must be considered. Indeed, if the poor are more price sensitive than richer individuals, user fees will reduce the utilization by the poor more than by the rich. In this case, uniform user fees would be regressive.

In this chapter we derive a discrete choice specification of the demand for medical care from a utility maximizing theoretical model and show how private time-price variation can be used to identify the parameters necessary to compute price elasticities and willingness-to-pay measures (compensating variations). The model makes use of the well known result that private prices, such as the opportunity cost of time, ration the market when monetary prices are absent or small (Becker, 1965). An added advantage of the model is that the theoretical framework naturally leads to an empirical specification that is flexible enough to allow the price elasticities and willingness-to-pay measures to vary by income levels.

The chapter is organized as follows. A review of the literature on the demand for medical care is provided in the next section. Then, a theoretical model of medical care provider choice in derived, and it's empirical counter-part specified.

5.2 Evidence from the Literature

The early literature on the demand for medical care in developing countries suggests that prices are not important determinants of medical care utilization. Akin et al. (1984, 1986), Schwartz (1988), Birdsall and Chuhan (1986), Heller (1982), all report very small and sometimes positive price effects, most of which are statistically insignificant. More recent work by

Mwabu (1986 and 1988), Gertler, Locay, and Sanderson (1987), Alderman and Gertler (1988), and Cretin, Keeler, Williams and Shi (1988) conclude that prices are important. All of the above studies except for Cretin et al. are discrete choice provider modes. The Cretin et al. study examined household medical expenditures in China and report that differences in coinsurance rates explain one-third of the variation in medical care expenditures.

The results of the early studies contrast sharply with most recent studies on the demand for medical care in developed countries which uniformly conclude that prices are important determinants of medical care utilization. The most important and comprehensive of these studies is the Rand Corporation's National Health Insurance Study (HIS), which was a 5 year controlled randomized trial experiment conducted in five sites in the U.S. with over 20,000 individuals (Manning et al., 1987). The HIS provides overwhelming evidence that prices are statistically significant determinants of health-care utilization. Price elasticities are found to be of the order of -.2. Moreover, the HIS results are on the low end of the prices elasticity estimates from the non-experimental literature, which finds statistically significant price elasticities ranging from -0.2. to as high as -2.1 (For example see Rosset and Huang, 1973; Davis and Russel, 1972; Phelps and Newhouse, 1974; Goldman and Grossman, 1978; Colle and Grossman, 1978; Newhouse and Phelps, 1974 and 1976).

The divergence between the literature on developed and most developing countries is somewhat paradoxical. Indeed, one would expect prices to be less important in the developed world than in the developing world. Two reasons are immediately apparent: (1) income levels are substantially higher in the developed world, and (2) medical care insurance is almost universal in

the developed world and is virtually non-existent in developing countries. Higher income levels and pervasive insurance coverage imply that medical care is a much smaller percentage of budgets in the developed world than in the developing world. One would expect individuals to be more sensitive to prices when these prices are bigger shares of this budget.

In addition, evidence from estimated income elasticities suggests that price elasticities should be higher in developing countries. We know, from the Slutsky decomposition of the price elasticity of demand that the price elasticity increases with the income elasticity, ceteris paribus (e.g. Deaton and Muellbauer, 1980). The empirical evidence shows that the demand for medical care is more income elastic in the poorer-developing countries than in the richer-developed countries. Engel curve estimates for medical care in Birdsall and Chuhan (1983) and Musgrove (1983) report income elasticities close to unity, whereas income elasticities between .2 and .3 are typically found for developed countries (for example see Van de Ven and van der Gaag, 1982; Holtmand and Olsen, 1978; Colle and Grossman, 1978; Goldman and Grossman, 1978;, Phelps, 1975, and Manning et. al., 1987).

In most developing countries, the price of medical care at government run facilities is small and in many cases zero. Hence, it is not surprising that prices do not ration the market. Acton (1975) and others have shown that when monetary prices are small, the price of time (ie. the opportunity cost of time used for obtaining the good) rations the market. One would expect, therefore, that time prices ration the market in developing countries. Indeed, in almost all of the studies on the demand for medical care in developing countries cited above, travel time is an important and significant

determinate of medical care demand. These results suggest that when monetary prices become larger, they will begin to ration demand as well.

How then can we explain the paradoxical results of zero price elasticities in developing countries? One explanation is that the models of medical care demand in developing countries are mis-specified. The studies typically model demand as a discrete choice with the price effect specified to be independent of income. This assumption is restrictive, since one would expect the wealthy to be less sensitive to price differences among providers than the poor. In fact it can be shown that these models are inconsistent with utility maximization (Gertler, Locay, and Sanderson, 1987). This point is demonstrated explicitly in the next section. Another possible cause for the paradoxical result is more straight forward. Many of the studies of medical data use sets of dubious quality. Especially information on income, prices and travel time leaves much to be desired. A final point is that the studies mentioned above specify time prices as non-monetary nuisance parameters in the utility function, implying that their coefficients reflect the marginal disutility of traveling. Becker (1965) points out that time prices should enter via the budget constraint. Dor, Gertler, and van der Gaag (1987) extend the Gertler et al. model by including time prices in the budget constraint to estimate travel time elasticities. Gertler and van der Gaag (1988) show that variation in travel time is sufficient to identify all of the parameters necessary to compute monetary price elasticities and compensating variations. We use the rest of this chapter to present this model in detail, and we will implement the model in the following chapter.

5.3 The Behavioral Model

Our framework is a model in which utility depends on health and on the consumption of goods other than medical care. If an illness is experienced, individuals decide whether or not to seek medical care. The benefit from consuming medical care is an expected improvement in health, and the cost of medical care is a reduction in the consumption of other goods and services.

Individuals have to decide not only whether to seek care, but also what type of care. They are able to choose from a finite set of alternative providers, one of which is self-treatment. Each provider offers an expected improvement in health (efficacy) for a price. Let us define the quality of an alternative provider as the expected improvement in health as a result of that provider's medical care. The price of an alternative includes both monetary outlays and private access costs such as the opportunity cost of travel time. Based on this information and their incomes, individuals choose the alternative that yields the highest utility.

Formally, let the expected utility conditional on receiving care from provider j be given by

$$U_j = U(H_j, C_j) \tag{1}$$

where H_j is expected health status after receiving treatment from provider j, and C_j is consumption net of the cost of obtaining care from provider j.

The medical care purchased from provider j is invested in health. The quality of provider j's medical care is defined as the expected

improvement in health over the health status that an individual would enjoy if he or she treated him or herself. In essence, quality is defined as an expected marginal product. Let H_0 be expected health status without professional medical care (i.e. self-treatment). Then, the quality of provider j's care is $Q_j = H_i - H_0$, which yields an expected health care production function of the form

$$H_j = Q_j + H_0. \tag{2}$$

As specified in (2), quality varies by provider, and may in fact also vary by individual characteristics such as severity of illness, and the education, age and sex of the individual.

The health production function assumes a simple form for the self-care alternative. Since $H_j = H_0$, we have $Q_0 = 0$. This implicitly normalizes the health care production function so that the quality of a particular provider's care is measured relative to the efficacy of self-care.

Consumption expenditures (net of expenditures on medical care) are derived from the budget constraint. The total price of medical care includes both the direct payment to the provider and the indirect cost of access (e.g. the opportunity cost of travel time). Let P_j^* be the total price of provider j's care and Y be income, so that the budget constraint is

$$C_j + P_j^* = Y, \tag{3}$$

with $C_j > 0$ required for the jth alternative to be feasible. Substitution of (3) into (1) for C_j yields the conditional indirect utility function

$$U_j = U(H_j, Y - P_j^*).$$

Notice that income affects utility through the consumption term, and that the price of medical care is foregone consumption.

The time spent obtaining care could, in principle, come at the expense of work in the market place, production work at home or leisure. In that case income Y and net consumptic C_j should incorporate the value of the three activities. In an economy that is only partially monetized, such as the one in rural Côte d'Ivoire, non-traded home production is a major source of income. We capture this by including the value of home production consumed by the household into the measure of income. However, adding the value of leisure would greatly complicate the model and is left for future work. Hence, we implicitly assume that lost time comes at the expense of work or home production and not at the expense of leisure. The measurement of income is discussed in Chapter VI.

We are now ready to specify the utility maximization problem. Suppose the individual has J+1 feasible alternatives (with the j=0 alternative being self-care). The unconditional utility maximization problem is

$$U^* = \max(U_0, U_1, \ldots, U_J), \tag{4}$$

whe.e U^* is maximum utility. The solution to (4) gives the alternative that is chosen, and when there are these random terms in the model, the probability that each alternative is chosen. The probability an alternative is chosen can be interpreted as the demand function in a discrete choice model. These demand functions, then, can be used to solve for the <u>unconditional</u> indirect

utility functions and the expenditures or cost functions. The unconditional functions can be used to make welfare assessments of the impact of policy changes.

In summary, individuals who experience an accident or illness are faced with a choice of obtaining treatment from one of several available providers or caring for themselves. Each alternative provider offers an expected improvement in health (quality) for a price that reduces income available for the consumption of non-medical goods. The individual chooses the provider alternative whose quality-price combination offers the highest utility, where utility is derived from health and the consumption of all goods and services other than medical care.

5.4 Empirical Specification

The solution to (4) yields a system of demand functions, whose forms are probabilities that the alternatives are chosen. The probability that a particular alternative is chosen equals the probability that this choice yields the highest utility among all the alternatives. The functional form of the demand functions depends on the functional form of the conditional utility function and the distribution of the stochastic variables.

5.4.a The Conditional Utility Function

Gertler, Locay and Sanderson (1987) show that income can influence the choice of provider only if the conditional utility function allows for a non-constant marginal rate of substitution of health for consumption. This point is easily demonstrated in the context of a two alternative example.

Suppose that the individual has the choice between self-care and doctor care, and that the conditional utility function is linear, which imposes a constant marginal rate of substitution. Thus, the utility from doctor care (denoted by subscript d) is:

$$U_d = \alpha_0 H_d + \alpha_1 (Y - P_d),$$

and the utility from self-care (subscript s) is:

$$U_s = \alpha_0 H_s + \alpha_1 Y.$$

Then, the individual chooses doctor care if

$$U_d - U_s = \alpha_0 (H_d - H_0) - \alpha_1 P_d > 0. \quad (5)$$

If the doctor alternative is chosen the individual experiences an improvement in health of $(H_d - H_s)$ and a reduction in non-medical consumption of P_d. If the individual chooses doctor care, he or she gets an increase in utility of $\alpha_0 (H_d - H_0)$ from improved health and a reduction in utility of $\alpha_1 P_d$ from reduced consumption. The decision rule in (5) says that the individual will choose doctor care if net change in utility is positive.

Equation (5) also shows that, if the marginal utility of health and the marginal utility of consumption are constant for all levels of income (i.e., if there is a constant marginal rate of substitution between health and income), then income does not contribute to which alternative is chosen. This is indicated by the fact the Y differences out of (5).

Some studies on health care provider choice try to include income in the model by specifying linear utility functions with alternative specific coefficients on income (Akin et al., 1984, 1986; Schwartz et al., 1988; Birdsall and Chuhan 1986; Dor and van der Gaag 1987; and Mwabu, 1986). This specification is inconsistent with stable utility maximiz ion. For instance, consider our earlier example with the exception that the coefficients on consumption vary by alternative:

$$U_d = \alpha_0 H_d + \alpha_{1d}(Y - P_d)$$

and

$$U_s = \alpha_0 H_0 + \alpha_{1s} Y.$$

Notice that the marginal utility of consumption is constant but varies by alternative. In this case, doctor care is chosen if

$$U_d - U_s = \alpha_0(H_d - H_s) - \alpha_{1d}P_d + (\alpha_{1d} - \alpha_{1s})Y > 0.$$

In this specification income does not difference out of the decision rule and therefore influences the choice. The identifying restriction, though, is that the coefficient on consumption must be different in the two alternatives. In other words, the marginal utility of consumption must be different for the two alternatives even when evaluated at the same level of consumption. This implies that two alternatives that provide the same health for the same price must yield different levels of utility to the same individual. If this is true, then preferences are not ordered and transitive, and therefore stable utility functions do not exist.

Alternatively, if the functional form does not impose a constant marginal rate of substitutional on the conditional utility function then income will influence the choice. To make this point we generalize the above example so that the decision rule in (5) is:

$$U_d - U_s = U(H_d, Y-P_d) - U(H_0, Y)$$

The income effect is found by the partial derivative

$$\frac{\partial(U_d - U_s)}{\partial Y} = \frac{\partial U(H_d, Y-P_d)}{\partial C} - \frac{\partial U(H_0, Y)}{\partial C} \qquad (6)$$

If the derivative of the conditional utility function with respect to consumption, $\partial U/\partial C$, is constant (i.e. $\partial^2 U/\partial C^2$ and $\partial^2 U/\partial C \partial H$ are zero), then (6) is zero and income does not influence the choice. When $\partial U/\partial C$ is non-constant, (6) is non-zero and income does influence the choice. Also the marginal rate of substitution, $-(\partial U/\partial H)/(\partial U/\partial C)$, is non-constant when $\partial U/\partial C$ is non-constant.

Another implication of the model is that if health is a normal good, the effect of price is smaller for larger incomes. This point requires the reasonable assumption that $\partial U^2/\partial C \partial H \geq 0$, (i.e., that the marginal utility of consumption increases with improved health). For health to be a normal good (6) must be positive. For (6) to be positive, $\partial^2 U/\partial C^2$ must be negative, i.e. the conditional utility function must be concave in consumption. Now we use this information to show that the effect of price diminishes with increases in income. The price effect from (8) is:

$$\frac{\partial(U_d - U_s)}{\partial P} = - \frac{\partial U(H_d, Y-P_d)}{\partial C}$$

Thus, an increase in income influences the price effect by

$$\frac{\partial^2(U_d - U_s)}{\partial P \partial Y} = - \frac{\partial U^2(H_d, Y-P_d)}{\partial C^2}.$$

Hence, an increase in income reduces the negative effect of price if $\partial^2 U/\partial C^2$ is negative. Therefore, if health is normal good (i.e. $\partial^2 U/\partial C^2 < 0$), the effect of price on the choice diminishes with income.

This point can be made in a more intuitive context. If health is a normal good, then the demand for health increases with income. A necessary condition for normality is that as income rises, the marginal rate of substitution of consumption for health diminishes, holding health constant. This point is demonstrated in Figure 1. where the continuous choice case wit health being a normal good is pictured. As income rises the point of utilit maximization moves out from the origin along the expansion path. Holding health constant at $\bar{H}$, we move to the right along the horizontal line as incor rises, intersecting the indifference curves at points of flatter slopes, implying a diminishing marginal rate of substitution.

In a discrete choice situation, normality implies that as income rises individuals are more likely to choose the 'higher price/higher quality' options. Here as well, a necessary condition for normality is that as income rises, the marginal rate of substitution of consumption for health diminishes holding health constant. This is demonstrated in Fig. 2, where the discrete choice case with health as a normal good is pictured. In Fig. 2, there is a choice between a 'high price/high quality' option (P_h, Q_h), and a 'low

price/low quality' option (P_ℓ, Q_ℓ). At a low income level, say Y_ℓ, the choice is between points A and B, i.e., between a gain in health of ($H_h - H_\ell$) and a gain in consumption of ($P_h - P_\ell$). At income Y_ℓ, the additional consumption is preferred to the additional health and the 'low price/low quality' option B is chosen. The high income individual with income Y_h has a choice between points C and D. These points represent the same tradeoff between health and consumption as points A and B. As income rises the marginal rate of substitution of consumption for health falls along both horizontal lines H_h and H_ℓ. Eventually, at some income between Y_ℓ and Y_h, the gain in health is preferred to the gain in consumption. At income Y_h, the 'high price/high quality' option C is chosen.

In summary, if health is a normal good, then higher income individuals will choose the high quality/high price option and lower income individuals will choose the low quality/low price option, *ceteris paribus*. In other words, the price difference dissuaded low income individuals from choosing the high quality/high price option, but it did not dissuade high income individuals. What matters in the choice is the budget share of medical care. For low income individuals the high quality/high price option represents a significant portion of their budget. Rather than give up, say, food, they choose the low quality/low cost option. Alternatively, the high quality/high price option is a small portion of high income individuals budgets implying that they don't have to give up much to choose it. Finally, to allow health to be a normal good and therefore allow income to influence the choice, the functional form of the conditional utility function should not impos constant marginal rate of substitution. Whether or not health is a

Figure 1: The Trade-Off between Health and Consumption

The Continuous Choice Case

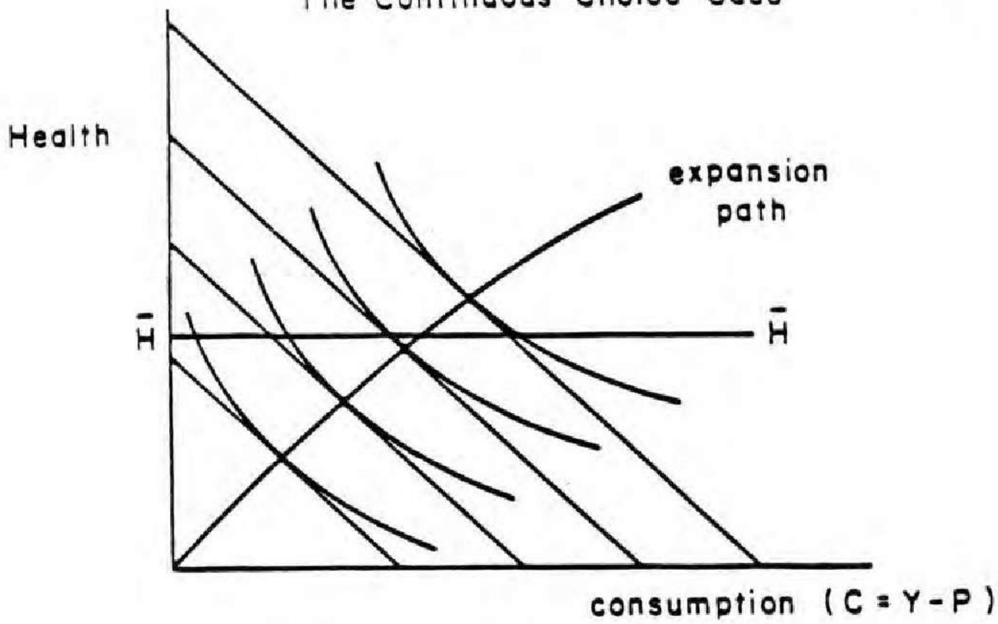
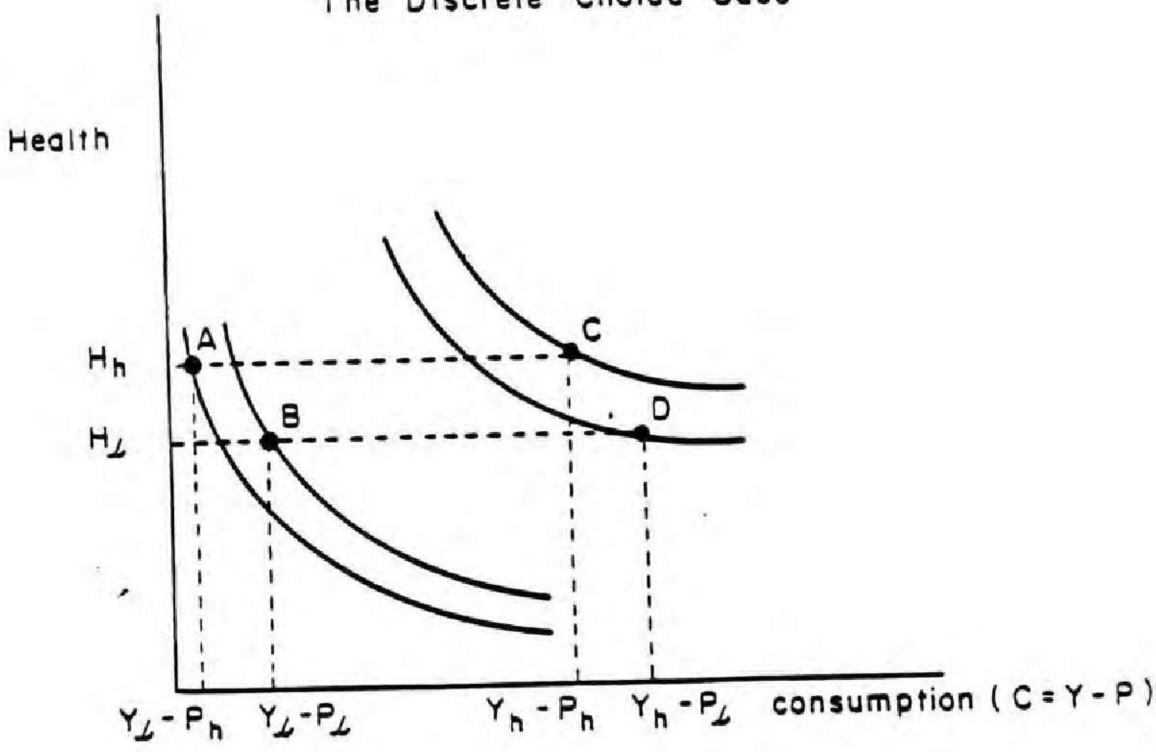


Figure 2: The Trade-Off between Health and Consumption

The Discrete Choice Case



normal good is an empirical question, and the functional form should be flexible enough for the data to answer this question.

A parsimonious functional form for the conditional utility function that does not impose a constant marginal rate of substitution and is consistent with stable utility maximization, is the semi-quadratic, which is linear in health and quadratic in consumption. Specifically, let the conditional utility function be

$$U_j = \alpha_0 H_j + \alpha_1 C_j + \alpha_2 C_j^2 + \varepsilon_j \tag{8}$$

where ε_j is a zero mean random taste disturbance with finite variance and is uncorrelated across individuals and alternatives.

Consumption (i.e. income net of the cost of obtaining care from provider j) is derived from the budget constraint in (3). Specifically, $C_j = Y - P_j^*$. The full price of medical care is the direct payment to the provider plus the value of time spent in obtaining the care. Consumption, then, is

$$C_j = Y - (P_j + wT_j) \tag{9}$$

where P_j is the direct payment to provider j, w is the opportunity cost of time, and T_j is the time spent obtaining care from provider j. Substitution of (9) into (8) yields

$$U_j = \alpha_0 H_j + \alpha_1 \big(Y - (P_j + wT_j)\big) + \alpha_2 \big(Y - (P_j + wT_j)\big)^2 + \varepsilon_j \tag{10}$$

Since $P_0 = H_0 = 0$, the conditional utility function for the self-care alternative

$$U_0 = \alpha_0 H_0 + \alpha_1 Y + \alpha_2 Y^2 + \varepsilon_0. \tag{11}$$

The identification of the parameters in (10) and (11) requires that the values of expected health and consumption differ across the alternatives. The alternative chosen is the one that yields the highest utility. Therefore, if the contribution of either expected health or consumption to utility is constant across alternatives they cannot influence which alternative is chosen. Attributes that are constant across alternatives are differenced out of the decision rule. This implies that it is variation in prices across alternatives that identifies α_1 and α_2. If prices did not vary across alternatives, then consumption would be constant across alternatives and difference out of the decision rule.

At this point it is easy to show that all of the parameters can still be identified if monetary prices are zero. The identification of α_1 and α_2 in (10) and (11) require variation in prices and/or travel time across alternatives so that the contribution of consumption varies across alternatives. Hence, variation in T_j across alternatives suffices to identify these parameters.

5.4.b <u>Quality</u>

The remaining issue in the specification of the conditional utility function is the measurement of the expected efficacy (quality) of each

alternative. Substitution of the health production function (2) into the conditional utility function (10) yields

$$U_j = \alpha_0 H_j + \alpha_0 Q_j + \alpha_1 (Y - P_j - wT_j) + \alpha_2 (Y - P_j + wT_j)^2 + \varepsilon_j. \qquad (12)$$

Since $Q_0 = 0$, the conditional utility function in (13) for the self-care alternative reduces to

$$U_0 = \alpha_0 H_0 + \alpha_1 Y + \alpha_2 Y^2 + \varepsilon_0. \qquad (13)$$

The $\alpha_0 H_0$ term appears in all the conditional utility functions, and its value is constant across alternatives. Since only differences in utility matter, these terms can be ignored.

Estimation is complicated by the problem that quality is unobserved, in the nonself-care conditional utility functions in (12). We solve this problem by letting Q_j be a parametric function of its observable determinants. The expected quality of provider j's care is the expected improvement in health (marginal product) over the expected level of health that would occur from self-treatment. The expected improvement in health can be viewed as being produced through a household production function. The arguments of the household production function are provider characteristics, and individual characteristics such as severity of illness and ability to implement the recommended treatment plan. For example, the expected improvement in health from hospital care relative to self-care may be increasing in education, since individuals with higher education may be better able to implement recommended treatment plans.

Moreover, the marginal utility of an individual's health may also vary with household characteristics. For example, the marginal utility of the health of a child may depend on how many children there are in the household. In general, the value of health may vary with many demographic variables such as age, sex, education, and family composition.

The basic determinants of both the quality household production function and the marginal utility of quality are demographic variables. Pollak and Wachter (1975) argue that the separate effects of demographic variables in the household production function and in the marginal utility of quality cannot be identified separately. Therefore, we specify a reduced form model that shows how utility is derived from quality. Formally, let this function be given by

$$\alpha_0 Q_j = \beta_{0j} + \beta_{1j} X + \eta_j, \tag{14}$$

where X is a vector of the determinants of quality and utility from quality, and η_j is a zero mean random disturbance with finite variance.

To make the specification as general as possible, we let the coefficients in (14) vary by alternative. Allowing for different intercepts permits the baseline quality to vary by alternative, and having different slope coefficients allows the provider's productivity relative to self-care to vary with individual characteristics such as age, education, and severity of illness. The random disturbance term captures unmeasured portions of the quality function. These disturbances may be correlated across alternatives.

Since $Q_0 = 0$, the utility from quality function simplifies to $\alpha_0 Q_0 = 0$ for the self-care alternative. Hence, the coefficients in (14) are interpreted relative to the self-care alternative. Notice further that the normalization sets the unobserved portion of quality in the self-care alternative, η_0, equal to zero as well.

Substitution of (14) into the conditional utility functions in (12) and ignoring the $\alpha_0 H_0$ term that appears in all the conditional utility functions, gives us

$$U_j = V_j + \eta_j + \varepsilon_j, \qquad (15)$$

where

$$V_j = \beta_{0j} + \beta_{1j}X + \alpha_1(Y - P_j - wT_j) + \alpha_2(Y - P_j + wT_j)^2 \qquad (16)$$

This completes the specification of the indirect conditional utility functions. Notice that the intercept and coefficients on the demographic variables vary by alternative, whereas the coefficients on the economic variables are constant across alternatives. Further, the disturbances in the nonself-care conditional utility functions are correlated with each other but, since $Q_0 = 0$, they are uncorrelated with the disturbance in the self-care conditional utility function.

5.4.c <u>The Demand Functions and Welfare</u>

The demand function for a provider is the probability that the utility from that alternative is higher than the utility from any of the other alternative. Most of the previous studies on the demand for medical care in

developing countries have assumed that these demand functions take on a multinominal logit (MNL) form. As discussed in McFadden (1981), the MNL suffers from the Independence of Irrelevant Alternatives assumption. This assumption is equivalent to assuming that stochastic portions of the cond:-ional utility functions are uncorrelated across alternatives, and imposes the restriction that the cross-price elasticities are the same across all alternatives. A computationally feasible generalization of the MNL is the Nested Multinominal Logit (NMNL), which was introduced in McFadden (1981). The NMNL allows for correlation across sub-groups of alternatives and, therefore, non-constant cross-price elasticities. The NMNL allows the grouping of more similar alternatives (i.e. closer substitutes) so that the cross-price elasticities are more elastic within groups than across groups. The NMNL also provides a specification test for groupings. Further, the NMNL is a generalization of the MNL as the MNL is "nested" within it. This provides us with a specification test.

The NMNL specification for our problem is as follows. Following McFadden (1981), we assume that the joint distribution of the η_i's and Σ_i is a type B extreme value distribution. Let choice 0 be the self-care alternative, and choice 1,..., J be the various provider alternatives. The η_j's imply that the error terms of the provider alternatives may be correlated with each other, but not with the self-care alternative. Therefore, the self-care demand function (i.e. the probability of choosing self-care) is

$$\Pi_0 = \frac{\exp(V_0)}{\exp\,(V_0) + \left[\sum_{j=1}^{J} \exp\,(V_j/\sigma)\right]\sigma}$$

and the demand for provider i is:

$$\Pi_i = (1 - \Pi_0)\left[\frac{\exp(V_i/\sigma)}{\sum_{j=1}^{J} \exp(V_j/\sigma)}\right]$$

where σ is one minus the correlation between the error terms of the providers conditional, utility functions introduced by the η_j's.

The log likelihood function for this problem is simply

$$\ln L_i = \sum_{j=0}^{J} D_{ij} \ln \Pi_{ij}$$

where D_{ij} is a dichotomous variable that takes on the value one if individual i chose alternative j. Although a two step estimate exists (McFadden, 1981), we will employ full information maximum likelihood to estimate the model. Hensher (1986) shows that full information maximum likelihood estimation of NMNL yields substantial efficiency gains over the more popular two-step procedure.

McFadden (1981) shows that σ must be between zero and one for the model to be consistent with utility maximization. When σ is close to zero, the error terms in the provider alternatives' conditional utility functions are highly correlated. This implies that individual views providers as closer substitutes with each other than any with self-care. In terms of cross-price elasticities, this implies that a provider's demand is more sensitive to another provider's change in price than is self-care demand. Thus, if σ is

less than one, an increase in one provider's price will cause a greater percentage increase in other providers' demands than in self-care.

Finally, as mentioned above, the MNL is a special case of the NMNL. Specifically, when $\sigma = 1$, the NMNL reduces to an MNL. In this case the error terms are uncorrelated and the self-care alternative and the providers are viewed as equally close substitutes for one another. Moreover, the cross-price elasticities are constant across alternatives. This condition provides a formal specification test of the MNL.

The estimated demand functions can be used to project the impact of user fees on demand and revenues, and on the number of people who do not seek health care as a result of user fees. These demand functions also form the basis of our measurement of the willingness to pay for reduced travel time to a medical care facility. The willingness-to-pay measure is calculated as a compensating variation, which is the amount of income that an individual must be compensated to make him or her just as well off after a price change as before the change. The effect of a price change on welfare involves both an income effect (reduction in Y-P) and a substitution effect (changes in the probabilities that the alternatives are chosen). Both must be taken into account in the compensating variation calculation. The calculation involves solving the demand functions to obtain the <u>unconditional</u> indirect utility and expenditure functions with which compensating variation experiments can be conducted. Small and Rosen (1981) provide the general theory for discrete choice demand systems. Consider changing the vector of provider travel times from T to T'. In the case of a nested multinominal logit, the compensating variation, CV, i.e., the amount of income that an individual must be given or is willing to forego to make him as well off at T' as he or she was at T is

$$CV = (1/\lambda)\{\ln[\exp(V_0) + [\sum_{j=1}^{J} \exp(V_j/\sigma)]^{\sigma}]$$

$$- \ln[\exp(V_0') + [\sum_{j=1}^{J} \exp(V_j'/\sigma)]^{\sigma}]\} \qquad (17)$$

where V_j and V_j' are evaluated at T and T', respectively, and where λ is the marginal utility of income.

In order for (17) to be exact, the marginal utility of income λ must be independent of alternative specific characteristics and price (McFadden, 1981; Small and Rosen 1981) Although λ is independent of quality, it is not independent of price. Specifically

$$\lambda = \partial U/\partial Y = \alpha_1 + 2\alpha_2(Y - P).$$

Since the prices are very small relative to income, λ is likely to be approximately constant across small differences in price. Hence, each individual's average marginal utility of income over the alternatives is a good approximation of λ. Although this is little variation in λ for an individual across alternatives, λ may vary greatly across individuals as there is substantial variation in income.

5.5. Summary

In this chapter we first drew attention to an apparent parodox in the health economic literature: price elasticities in developing countries are

reported to be lower than in the developed world. We presented various reasons why the opposite could be expected. We also discussed some of the theoretical and empirical shortcomings in the literature on the demand for health-care in developing countries.

Based on this discussion, we derived a fairly general and flexible model of the demand for medical care that has the following attractive properties:

1. It is consistent with utility maximization which allows us to use the derived demand functions for welfare analysis.

2. It is flexible. In particular, the effect of price on the demand for medical care is allowed to differ by income level.

3. It is empirically tractable.

These properties allow us the answer the main empirical question of this study: how price elastic is the demand for medical care. We will do so in the next chapter.

CHAPTER 6

Estimation and Results

6.1 Introduction

In this chapter we describe the estimation of the model of medical care provider choice developed in the previous chapter. The main purpose of the estimation is to obtain price elasticities of demand so as to be able to investigate the cost recovery, utilization, and welfare implications of various user fee policies. The estimation results for both countries and for all age groups show that prices are important determinants of medical care utilization. Moreover, as expected, we find that the price elasticity of demand falls with income. Demand is in the elastic range for the lowest income groups, while it is inelastic in the upper income groups. These results imply that user fees can generate substantial revenue without much affect on the utilization by individuals in the upper income groups, but may cause large reductions in utilization by individuals in the lower income groups.

The policy and overall welfare implications of these results will be explored in detail in the next chapter. In this chapter we describe the data and the estimation results. The chapter is subdivided into sections on Côte d'Ivoire and Peru, respectively. We begin by discussing the relevant provider choices available within the institutional structure of each country, and the measurement of the variables that are used in the estimation. Subsequently, we present the estimated coefficients and price elasticities.

The models are estimated with data from the 1985 Côte d'Ivoire Living Standards Survey (CLSS) and the 1985 Peruvian Living Standards Survey

(PLSS). These identical multipurpose household surveys were aimed at measuring socio-economic factors relevant to the standard of living of the respective populations. The surveys collected detailed information on individuals' illnesses and medical care utilization over the four weeks immediately prior to the interview, in addition to many socio-economic variables relevant to medical care demand such as income, family structure, and education. A useful feature of the Living Standards Surveys is that they also collected community level information in rural areas. For each village, information on travel time to the nearest available medical facility of every type, and village level male and female agriculture wage rates were collected.

To ensure flexibility in the empirical specification, separate models are estimated for children and adults in both countries. All of the models are estimated by full information maximum likelihood.

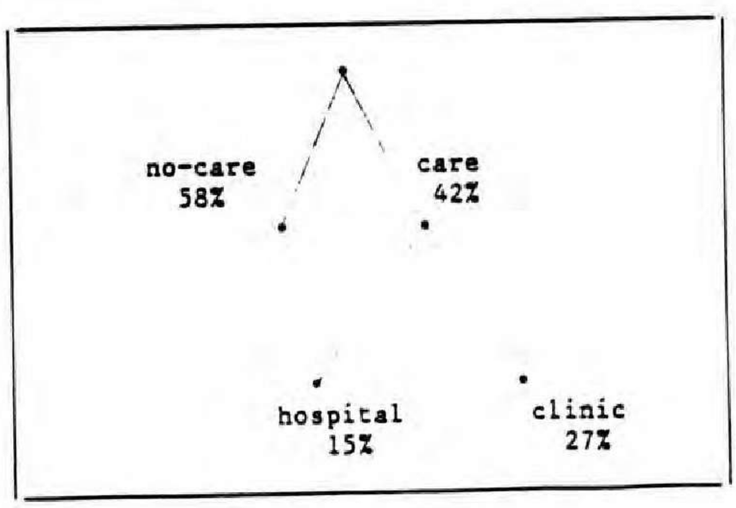
In the appendix to this chapter, we report the estimation results of the misspecified model used in earlier work (Akin et al., 1984, 1986; Birdsall and Chuhan, 1986; Dor and van der Gaag, 1987; Mwabu, 1986; and Schwartz et al., 1988). These results also indicate that prices are statistically significant determinants of medical provider choice. Since, as pointed out in the previous chapter, these models are inconsistent with utility mazimization, the results cannot be interpreted structurally. Therefore, the estimates are not representative of demand function parameters, but rather of reduced form correlations.

6.2 Côte d'Ivoire

6.2.a Institutions and Measurement of Variables

In rural Côte d'Ivoire, almost no private health care is available and few people report using it. The vast majority of individuals who experience an illness or accident seek care from either a government hospital or clinic, or do not obtain any professional medical treatment at all. Traditional healers do exist, but less than 3% of the report obtaining traditional care. Therefore, we leave them out of the analysis. Finally, only a handful of people in rural areas travel the very long distance to an urban area to go to a private doctor or to a pharmacy. Given this information, the relevant medical care alternatives for residents of rural Côte d'Ivoire appear to be government hospitals, government clinics, and self-care. The distribution of health-care provides choices in our sample as given in Figure 1. Of the 42% of individuals who seek professional medical care for an illness, about 2/3 go to clinics and 1/3 to hospital outpatient centers.

FIGURE 1.: Health-care Provider Choice
Rural Côte d'Ivoire, Total Population



It is this split of the sample (those who do not seek care, those who go to a hospital clinic and those who visit a clinic) that we try to explain with our theoretical model. For ease of reference, we repeat this model here. Let Π_j be the probability that an individual chooses alternative j, with j=0 being the self-care alternative. Then

$$\Pi_0 = \frac{\exp(V_0)}{\exp(V_0) + [\sum_{j=1}^{J} \exp(V_j/\sigma)]^{\sigma}}$$

and
$$\Pi_i = (1-\pi_0) \left[\frac{\exp(V_i/\sigma)}{\sum_{j=1}^{J} \exp(V_j/\sigma)^{\sigma}}\right]$$

where σ is one minus the correlation between the error terms of the provider alternatives (self-care excluded). Thus the model is specified as a Nested Multi-Nomial Logit model that collapses into a Multi-Nomial Logit model if we find that $\sigma = 1.00$. The term V_j represents the utility derived from alternative j, and is parameterized as

$$V_j = \beta_{0j} + \beta_{1j}X + \alpha_1(Y - P_j - wT_j) + \alpha_2(Y - P_j - wT_j)^2$$

where X is a vector of socio-economic variables

Y is total income

P_j is the fee for provider j

w is the opportunity cost of time, and

T_j is the travel time to provider j.

The term $(Y - P_j - wT_j)$, which enters both in linear and quadratic form, shows the effects of income and prices (both monetary and non-monetary) on the demand for medical care. The vector X includes variables such as age, sex, and education, that may influence the efficacy of obtaining care from a specific provider as well as the value (utility) the individual (or household) puts on an increase in health status.

As specified in the theoretical model, an alternative that yields the highest utility is chosen, where utility depends on the expected quality (improvement in health) and on consumption net of medical care. The expected quality and consumption net of medical care must be specified for each option.

Consumption net of medical care is income less the cost of obtaining medical care. Income is calculated as the average monthly value of total household consumption. Household consumption is a better measure of permanent income than reported income because it is less sensitive to temporary fluctuations (e.g. seasonality of work) and because it includes the value of home production. In developing countries such as Côte d'Ivoire and Peru, non-market activities such as home production are major sources of income. In Côte d'Ivoire the value of home-grown produce consumed by the household amounts to approximately half the food budget and one third of total consumption. Purchasing medical care not only reduces the monetary resources available for other consumption, but also reduces time available for home production and other work.

Since the government facilities had no user fees in 1985, the price of care was the opportunity cost of time spent in obtaining care. Recall from the theory chapter that variation in travel time is sufficient to identify all the parameters of the demand functions, thus allowing calculation of price

elasticities and willingness-to-pay measures. The opportunity cost of time is calculated as the product of the round-trip travel time and the individual's wage rate. For children, the opportunity cost of the mother's time is used. The round trip travel time for each individual to each alternative comes from the community survey, and the appropriate village male or female agricultural wage rate is taken as the unit opportunity cost of time.

The male and female village agricultural wage rates are reasonable estimates of the opportunity cost of time. Newman (1987) shows that 93% of all working adults in rural areas of Côte d'Ivoire are engaged in agricultural activities. Moreover individual variation in wage rates within village is likely to be small since over 90% of the adults have less than one year of schooling.

The utility derived from an expected increase in health status is specified to be a function of the option chosen and individual characteristics. The arguments of the alternative specific functions are individual and family characteristics that may affect quality and the marginal utility of quality. Variables that may influence the efficacy of medical care include age, the number of healthy days last month, education, the number of other adults in the household, and the number of children in the household. Age and the number of healthy days proxy for health status. Age is entered in spline form with the break occurring at 40 years old for adults and at 3 for children. The break points were determined by grid searches, which involve finding the break points that maximize the likelihood function. Education (years of schooling) is included since more educated individuals may be better able to implement recommended treatments and therefore produce more health relative to self-care than can less educated individuals. In the case of

children the mother's education is used. The family composition variables are included because the more adults and fewer children there are in the household, the better able a household may be at self-treating an illness. Variables that may affect the marginal utility of quality include age, sex and household composition.

Since the vast majority of individuals living in rural Côte d'Ivoire are farmers (97%), the sample used for estimation excluded non-farm households. The sample also excluded households in villages for which the community information was not available. In order to focus on primary medical care, visits for obstetric and other preventive purposes were excluded. There were 19 such cases. The exclusion of villages without community level data reduced the sample by 8%. The final sample included 49 villages, with observations of 1030 adults and 769 children under age 16 who experienced an accident or illness in the four weeks prior to the survey.

Descriptive statistics are presented in Table 1. We see that 24% of the adults and 30% of the children who report an illness or injury visit a clinic, while 15% of adults and 14% of children obtain outpatient hospital care. It is noteworthy that the average travel time is about an hour to clinics and about an hour and three quarters to a hospital.

TABLE 1. Descriptive Statistics - Côte d'Ivoire

	Adults		Children	
Variables	Mean	Standard Deviation	Mean	Standard Deviation
Clinic a/	0.24	(0.49)	0.30	(0.55)
Hospital a/	0.15	(0.38)	0.14	(0.37)
Clinic Travel Time b/	1.18	(1.32)	0.92	(1.16)
Hospital Travel Time b/	1.90	(.92)	1.56	(1.60)
Monthly Family Income c/	97.85	(81.19)	108.41	(99.66)
Hourly Wage d/	75.48	(28.54)	74.89	(26.42)
Age	44.85	(17.12)	6.33	(3.64)
Male	0.46	(0.50)	0.51	(0.50)
Education	0.85	(2.16)	0.91	(2.88)
Healthy Days	18.60	(9.94)	22.34	(7.24)
Number of Adults	4.57	(2.96)	4.62	(3.01)
Number of Children	4.86	(2.44)	4.97	(2.77)
Sample Size	1030		769	

a/ Binary variables; equals one if alternative is chosen and zero otherwise.

b/ Round trip travel time; reported in hours.

c/ Calculated as total household consumption and reported in thousands of 1985 Ivorian CFA's. In 1985, the exchange rate was approximately 461 CFA per U.S. dollar.

d/ Reported in 1985 Ivorian CFA's.

6.2.b **Estimation Results**

The nested-multi-nomial logit (NMNL) models of provider choice in rural Côte d'Ivoire were estimated by full information maximum likelihood. One model was estimated for the adults and another for children. The results are presented in Table 2, and are generally consistent with economic theory.

The estimated value of σ is .34 for adults and .41 for children. The estimates are both significantly different from zero and significantly different from one. Therefore, the models are both consistent with utility maximization and reject the MNL specification in favor of the NMNL. The result that σ is less than one also implies that hospital and clinic care are closer substitutes than hospital and self-care or clinic and self-care.

In both the adults' and children's models the coefficients on the consumption and/or its square are significantly different from zero. The signs of the coefficients indicate that the conditional utility function is concave in consumption. In other words, the marginal utility of consumption is diminishing, but does not become negative in the relevant range. Prices enter the model via the consumption terms. As shown in Chapter V, if the prices did not vary across alternatives, the coefficients on consumption would not be identified as the value of consumption would then be constant across alternatives. The fact that these coefficients are significant implies that the relative prices of the alternatives are relevant to the choice of the provider. Prices and income enter the model in a highly non-linear fashion through the consumption terms, making it hard to judge the order o_ magnitude of their effects. Therefore, we will examine them in detail in the next

section. This section is devoted to discussing the effects of the other variables. We begin with the adults and then consider children.

Unlike in developed countries, adults in rural Côte d'Ivoire seem to reduce medical care utilization over the life cycle, <u>ceteris paribus</u>. The coefficients on the first age spline indicates that individuals between the ages of 16 and 40 are equally likely to seek medical care for the treatment of an accident or illness. After age forty, though, the demand for both hospital care and clinic care falls with age.

TABLE 2: **The Multi-Nomial Logit Model of Provider Choice Estimates - for Côte d'Ivoire**

Variable	Adults Coefficient	Adults t-Statistic	Children Coefficient	Children t-Statistic
Consumption*	10.04	(5.44)	14.43	(5.65)
Consumption** squared	-0.02	(3.30)	-0.01	(2.14)
Sigma	0.34	(3.54)	0.41	(4.37)
<u>Hospital</u>				
Constant	1.64	(1.20)	2.68	(2.54)
Age 1	-0.00	(0.11)	-0.69	(2.31)
Age 2	-0.10	(2.82)	-0.04	(0.64)
Education	-0.05	(0.45)	-0.05	(0.13)
Male	0.73	(1.68)	0.05	(0.13)
Children	0.17	(2.17)	0.21	(2.44)
Adults	-0.15	(1.69)	-0.19	(2.06)
Healthy Days	-0.13	(3.32)	-0.09	(2.71)
<u>Clinic</u>				
Constant	0.69	(0.51)	2.50	(2.51)
Age 1	0.02	(0.66)	-0.64	(2.40)
Age 2	-0.10	(2.60)	0.04	(0.76)
Education	-0.03	(0.31)	0.00	(0.50)
Male	-0.07	(0.16)	0.17	(0.46)
Children	0.15	(1.89)	0.18	(2.28)
Adults	-0.15	(1.78)	-0.21	(2.30)
Healthy Days	-0.10	(2.45)	-0.06	(2.05)
Sample Size	1030		769	
Log Likelihood	-886		-679	

One explanation for this unusual pattern of medical care utilization over the life cycle may be derived from human capital theory. Families may prefer to invest scarce resources in the health of members for whom the return is higher. For the same improvement in health, the economic return, in terms of family income, is higher from investing in the health of younger more productive members than from investing in the elderly. A second reason may be that the available medical care in rural Côte d'Ivoire is best suited for helping the acute health problems common to prime age adults rather than the more complex chronic problems of the aged. Hence the available medical care is less productive (efficacious) in treating the elderly than in treating prime age adults, resulting in lower utilization rates of the latter.

Again unlike in developed countries, education does not seem to effect provider choice or the decision to seek formal care. The negligible education effect is most likely to result from the small variation in education in the Ivorian sample. The average years of schooling is less than one year. Therefore, the estimated coefficient is probably not a true measure of the influence of education on medical care utilization.

We find that males who experience an accident or illness are more likely to seek care, and in particular hospital care, than are females. This is again consistent with the theory of investing in the more productive household members, or at least in household members that are considered to be more productive. It could also be a sign of gender bias that warrants more scrutiny than can be given within the scope of this study. Finally, the types

of illnesses males experience may be better treated within the current Ivorian health-care infrastructure than the types of illnesses females experience.

The coefficients on the family structure variables indicate the individuals in the households with fewer adults and more children are more likely to seek both hospital and clinic care. This is consistent with the hypothesis that having more adults in the household allows more time to better care for sick individuals at home, and having more children results in having less time to take of the ill.

Finally, and not surprisingly, severity of illness, as indicated by the number of healthy days, substantially reduces the probability of an adult seeking medical care, but it does not affect which alternative is chosen. This finding is common to almost all studies of medical care utilization in both the developed and developing world. One caveat is that the number of days an individual was healthy may be endogenous in a model of medical care demand. To ensure the robustness of our price and income effects, we reestimated the model on both adult and children samples without including the healthy days variable. There was no difference in the estimated coefficients on the other variables.

The results from the model for children are similar to those for adults. The pattern of medical care utilization through childhood is described by the coefficients on the age splines. They show that demand falls with age from zero to three years old and is flat thereafter. In other words, that infants who experience an accident or illness are more likely to seek medical care than older children, and more likely to seek the higher quality hospital care over clinic care.

As in the adult model, mother's education does not influence provider choice, and again we attribute this to the lack of variation in the data rather than interpret it as a true education effect. Unlike the adult model, though, there are no differences by sex. Again as in the adult model, severity of illness increases the demand for medical care, the number of adults in the household has a negative effect on the probability of going to both clinics and hospitals, while the number of children has positive effects.

6.2.c Price Elasticities

Since prices and income enter the demand functions in a highly non-linear fashions, it is hard to assess the direction and magnitude of their effects on demand directly from the estimation results in Table 2. To facilitate this, we estimate arc price elasticities of the demand for clinic and hospital care by income quartiles. The arc elasticities are obtained by sample enumeration (Train, 1986) within each income quartile. More specifically, the probability of an individual choosing an alternative at the bottom and top of the price range we consider, is predicted for every individual in the income group. Only the price of the alternative being considered is changed for these calculations. In order to hold constant all characteristics except for price and income, each individual was assigned other characteristics equal to the sample mean. Thus, within an income group, only the price varies, and within a price range, only income varies. The arc price elasticity is then constructed by dividing the average percentage change in the sum of the probabilities, by the average percentage change in the

price. Thus an arc price elasticity of, say, -.50 implies that a 10% increase in price will result in a 5% reduction in demand.

Arc price elasticities of the demand for clinic care and the demand for hospital care were calculated for three ranges of CFA 50 each, ranging from free care to a fee of CFA 150. These are within-sample calculations as the opportunity cost of time averages about 100. The arc price elasticities for adults are presented in Table 3 and for children in Table 4. Reading down a column of Table 3 or 4 shows the change in the price elasticity moving down the demand curve, holding income constant. Reading across a row of Table 3 or 4 reflects the change in the price elasticity as income rises, holding price constant.

The results show that the price elasticity of demand falls with income. Indeed, adults' and childrens' demand for both clinic and hospital care is vastly more elastic at lower income levels than at the top of the income distribution. Clinic and hospital demand of both adults and children in the bottom three-quarters of the income distribution is in the price elastic region, whereas demand from those in the top income quartile is well into the inelastic region. In addition, childrens' demand for both clinic and hospital care is more price elastic than is adults' demand. The difference is smaller in the lower income groups, but is substantial in the highest income group. These results indicate that user fees will be regressive in the sense that they reduce medical care utilization by the poor substantially more than by the rich. Furthermore, user fees will reduce the utilization of medical care by children more than they will reduce utilization by adults. On the other hand, user fees can generate substantial revenues without adverse utilization effects in relatively better-off communities. We will come back to these implications in Chapter VII.

TABLE 3: ARC Price Elasticities by Income Quartile
Côte d'Ivoire; Adults

Range of Fees*	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)
Clinic				
0-50	-0.61	-0.58	-0.53	-0.38
50-100	-1.16	-0.40	-0.19	-0.05
100-150	-1.83	-1.71	-1.57	-0.93
Hospital				
0-50	-0.47	-0.44	-0.41	-0.29
50-100	-0.86	-0.81	-0.76	-0.51
100-150	-1.34	-1.27	-1.18	-0.71
Mean Income **	33.28	64.44	99.52	222.87

* Measured in Ivorian CFA.
** Measured in thousands of Ivorian CFA per month.

TABLE 4: ARC Price Elasticities by Income Quartile
Côte d'Ivoire; Children

Range of Fees*	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)
Clinic				
0-50	-0.90	-0.80	-0.67	-0.31
50-100	-1.81	-1.56	-1.29	-0.51
100-150	-2.82	-2.43	-1.98	-0.66
Hospital				
0-50	-0.65	-0.58	-0.49	-0.12
50-100	-1.34	-1.17	-0.98	-0.20
100-150	-2.32	-1.98	-1.60	-0.48
Mean Income **	33.28	64.44	99.52	222.87

* Measured in Ivorian CFA.
** Measured in thousands of Ivorian CFA per month.

Implicit in the calculations of these price elasticities are the effects of travel time on utilization, working through the opportunity cost of time. To explicitly investigate the rationing effects of facility location, we calculate travel time elasticities. In order to estimate how travel time affects demand across income groups we need to allow wage rates (the opportunity cost of time) as well as income to vary across the income quartiles. We use the agricultural wage rate associated with each income quartile for these calculations.

Arc travel time elasticities of the demand for clinic care and the demand for hospital care were calculated for four ranges of one hour each, covering 0 to 4 hours. They are presented in Table 5 for adults and in Table 6 for children. Reading down a column of Table 5 or 6 reflects the change in the time elasticity for increasing travel time, holding income constant. Reading across a row of Table 5 or 6 reflects the change in the time elasticity as income rises, holding time constant.

The magnitude of the travel time elasticity estimates are very similar to the price elasticity estimates. This is not surprising since the opportunity cost of time is currently the whole price of medical care in Côte d'Ivoire, thus time prices ration the market. The elasticity estimates show individuals in the bottom 3/4 of the income distribution to be much more sensitive to the opportunity cost of time than richer individuals in the top quarter. Moreover, children's medical care utilization is more sensitive to time than adults' utilization in the higher income groups, but not for the lower income groups. One interesting result is that demand becomes slightly more time elastic as income rises over the bottom three income quartiles.

This reflects the increase in wage rates (i.e. the opportunity cost of time) over these income groups.

These results imply that the opportunity cost of time is a bigger access barrier for poorer individuals than it is for richer individuals. Poorer individuals can less afford to loose productive time than can the rich. The lower income groups in our sample consist of subsistence farmers who obtain a good portion of their income in the form of self-produced food. Moreover, little income is available to purchase processed goods which in turn implies that many hours must be spent in home production activities such as gathering wood and fetching water. Our results clearly underscore that poor people are not just money-poor, they are also time-poor. Therefore, increasing the supply of health-care facilities in poor areas is a _sine qua non_ for improving access. In other words, if improving the poor's access to medical care is a major goal of social policy, providing the care "free of charge", is simply not enough.

TABLE 5: **ARC Travel Time Elasticities by Income Quartile - Côte d'Ivoire Adult**

Range of Time*	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)
Clinic				
0-1	-0.35	-0.32	-0.28	-0.14
1-2	-0.61	-0.57	-0.50	-0.24
2-3	-0.85	-0.83	-0.72	-0.33
3-4	-1.10	-1.09	-0.95	-0.42
Clinic				
0-1	-0.25	-0.23	-0.21	-0.11
1-2	-0.44	-0.42	-0.37	-0.19
2-3	-0.65	-0.62	-0.55	-0.27
3-4	-0.85	-0.84	-0.74	-0.34
Mean Income **	33.29	64.44	99.52	222.87

* Time is reported in hours.
** Measured in thousands of Ivorian CFA

TABLE 6: **ARC Travel Time Elasticities by Income Quartile - Côte d'Ivoire Adults**

Range of Time* Change	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)
Clinic				
0-1	-0.53	-0.54	-0.54	-0.40
1-2	-0.93	-0.96	-0.98	-0.68
2-3	-1.33	-1.39	-1.43	-0.92
3-4	-1.72	-1.80	-1.88	-1.10
Hospital				
0-1	-0.41	-0.42	-0.42	-0.31
1-2	-0.71	-0.73	-0.75	-0.57
2-3	-1.03	-1.07	-1.12	-0.75
3-4	-1.37	-1.44	-1.52	-0.95
Mean Income **	33.29	64.44	99.52	222.87

* Time is reported in hours.
** Measured in thousands of Ivorian CFA

6.3 Peru

6.3.a Institutional Environment and Measurement of Variables

Since the data for the Peru models come form a survey instrument that is virtually identical to the one used for the Côte d'Ivoire survey, the empirical specification and the variables are constructed in almost the same way. Some differences are necessary as the institutional environment is different. Specifically, unlike Côte d'Ivoire, there is a large private health-care sector which charges fees for utilization of their services. In this section we highlight the differences between Peru and Côte d'Ivoire, relevant for estimating the Peruvian provider choice model.

Rural Peru has a mix of public and private medical care. The major provider of public medical care is the Ministry of Health, which operates hospitals and clinics. These institutions are administrated at the health department (region) level, where the user fee is set. In 1985/1986, user fees were very low. We used the department's median clinic and hospital fee paid by individuals in our sample as monetary prices. There are 14 departments in our sample. The total prices of clinic and hospital care are the sum of the department level monetary prices and the opportunity costs of time, where the opportunity cost of time is calculated as the product of the round-trip travel time and the appropriate village level agricultural wage rate. For children the opportunity cost of the mothers' time is used.

The dominant private pr--iders are physicians. As was true with Côte d'Ivoire, very few individuals reported seeking care from a traditional healer, so we leave them out of the analysis. We use median private doctor prices paid by individuals in each department in our sample as monetary

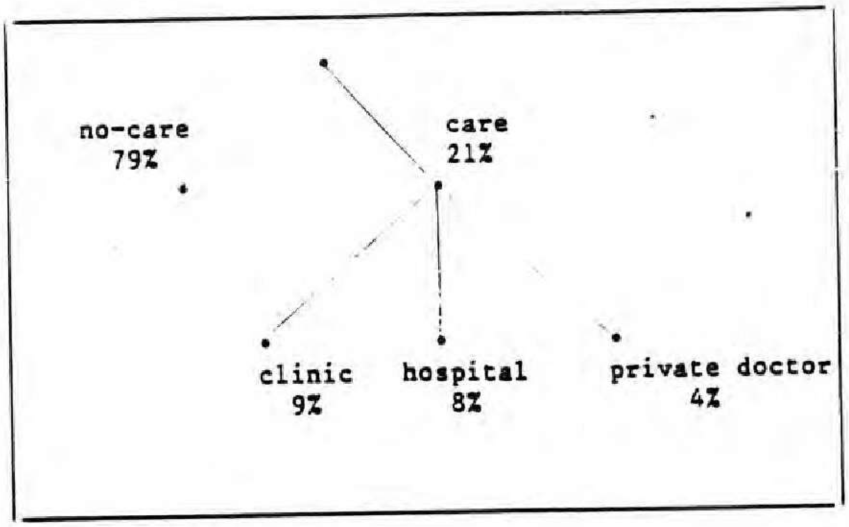
prices. Again, the total price of private care is the sum of the village level monetary price and the opportunity cost of time.

In the Peruvian specification, an individual experiencing an illness or accident has four alternatives: private doctor, government hospital, government clinic, or self-care. The distribution of provider choice in our sample is given in Figure 2. It is interesting to note that Peruvians who experience an illness or injury, use medical care only about half as much as Ivorians.

Consumption net of medical care expenditures for each alternative is computed as income minus the sum of the monetary price of the alternative and the opportunity cost of travel time. Income is computed as the annual value of total household consumption divided by 12, and the opportunity cost of time is the appropriate male or female wage rate times the round trip travel time.

The arguments of the alternative specific utility of quality functions are the same as used in the Côte d'Ivoire section. They are age, the number of healthy days last month, education, the number of other adults in the household, and the number of children in the household. Again, age is entered in spline form with the break occurring at 40 years old for adults and at 3 for children. Education is calculated as years of schooling with mother's education being used for children.

FIGURE 2: **Health-care Provider Choice in Rural Peru**



In the Peru models, 37% of the households were excluded because they were in villages for which community level information was unavailable. A few visits for obstetrics and other preventive purposes were also excluded. The final sample included 1254 adults and 969 children under age 16 from 98 villages.

Thus, the main differences between the Ivorian and the Peruvian model are: (1) in Peru the patient has four, rather than three, choices and (2) the cost of obtaining care includes a monetary component as well as a travel time component. Note that rural Peruvians households are on average better-off than their Ivorian counterparts. In dollar terms, monthly per capita income is about $34 as compared to $23 in Côte d'Ivoire.

TABLE 7: Descriptive Statistics - Peru

	Adults		Children	
Variables	Mean	Standard Deviation	Mean	Standard Deviation
Clinic a/	.13	0.29	0.08	0.27
Hospital a/	.08	0.27	0.05	0.21
Doctor a/	.04	0.19	0.04	0.19
Clinic Price c/	1.32	0.76	1.37	0.86
Hospital Price c/	2.43	1.06	2.30	1.01
Doctor Price c/	22.27	16.57	23.95	16.59
Clinic Travel Time b/	2.02	2.68	2.30	2.70
Hospital Travel Time b/	4.56	6.23	4.83	6.11
Doctor Travel Time b/	3.54	2.92	3.56	2.88
Monthly Family Income c/	1262.24	1332.86	1320.35	1179.45
Hourly Wage c/	0.18	0.11	0.19	0.12
Age	43.52	18.11	6.52	4.48
Male a/	0.42	0.50	0.51	0.50
Education	2.28	2.76	3.25	3.60
Healthy Days	25.00	5.42	25.19	4.97
Number of Adults	3.16	1.35	2.71	1.05
Number of Children	2.62	2.01	3.83	1.59
Sample Size	1254		969	

a/ Binary variables; equals one if alternative is chosen and zero otherwise.

b/ Round trip travel time; reported in hours.

c/ Reported in June 1985 Peruvian Intis.

6.3.b Estimation Results

The results of maximum likelihood estimation of medical care provider choice models of Peruvian children and adults are presented in Table 8. As for Côte d'Ivoire, the coefficients on the consumption term and its square are significantly different from zero in both the adults' and children's models. These results confirm that the relative prices of the alternatives are important determinants of provider choice. The direction and magnitude of the price and income effects are examined in the next section. This section discusses the effects of the other variables. We begin with the adults' model and then turn to the results for children.

The estimated value of σ is .98 for adults and .44 for children. The estimate of σ in the adult model is significantly different from zero, but we could not reject the hypothesis that it is different from one. Therefore, the adult model is consistent with utility maximization, but the MNL is not rejected in favor of the NMNL. The estimates of in the children's model is significantly different from zero and from one. Therefore, the children's model is consistent with utility maximization, and rejects the MNL specification in favor of the NMNL.

Utilization of medical care by Peruvian adults over the life cycle differs from the use of health-care by adults in Côte d'Ivoire. The coefficients on the age splines indicate that an adult who experienced an accident or illness, is more and more likely to seek professional medical care as he or she ages until forty years old. After age forty, utilization continues to increase with age but at a slower rate.

Education has a strong positive effect on the decision to seek medical care. Moreover, educated individuals show a preference for the higher quality hospital and private care over the lower quality clinic care. This conforms better to results from developed countries than the Ivorian results on this issue. Generally, one finds that education strongly influences the decision to seek medical care, and that more educated individuals choose the higher quality options. This adds further to our belief that the negative education results for Côte d'Ivoire are due to the lack of variation in the education variable rather than reflecting a true education effect.

We find that females are much more likely to seek medical care to treat an illness or accident, and are more likely to choose hospital than private physician care or clinic care. This is the opposite to what we found in Côte d'Ivoire, but at this point we can only speculate about whether this is a gender-bias affect, the result of rational decisions based on the expected productivity of the individual, or the efficacy of the health care system in treating gender specific illnesses.

The other variables were commensurate with the Côte d'Ivoire results. Not surprisingly, the number of healthy days last month significantly reduces the probability of seeking medical care. The number of adults in the household has a negative effect on the probability of going to both clinics and hospitals, while the number of children has positive effects. Thus, families with more adults and fewer children are better able to care for sick family members at home, than are families with fewer adults and more children.

The results from the model for Peruvian children are in general similar to those from the Peruvian adult model and conform to most studies on medical care demand in developed countries. The age profile of health care utilization is identical to Côte d'Ivoire. Infants have the highest probability of seeking medical care to treat an accident or illness. The probability then falls with age until three years old and is flat thereafter, ceteris paribus.

We also found that more educated mothers are more likely to use clinic care. This result is consistent with previous work. Although we are not aware of studies that focus exclusively on children's health-care demand in developing countries, mother's education has been shown to have a strong positive effect on children's health status (e.g. Strauss, 1988). Medical care utilization by Peruvian children does not differ by gender, which matches what we found in Côte d'Ivoire.

TABLE 8: **The Nested Multi-Nomial Logit of Provider Choice Estimates for Peru**

Variable	Adults Coefficient	Adults t-Statistic	Children Coefficient	Children t-Statistic
Consumption*	5.13	(2.14)	6.88	(2.37)
Consumption squared**	-0.16	(2.26)	-0.21	(2.04)
Sigma	0.98	(2.03)	0.44	(1.71)
Private Doctor				
Constant	-1.04	(0.56)	-2.30	(1.99)
Age1	0.01	(0.40)	-0.59	(1.35)
Age2	0.01	(0.39)	-0.15	(1.84)
Education	0.18	(2.61)	0.00	(0.58)
Male	-0.26	(0.70)	0.61	(0.34)
Children	0.03	(0.31)	0.27	(1.91)
Adults	-0.45	(4.52)	-0.83	(2.36)
Healthy Days	-0.08	(3.34)	-0.26	(3.30)
Hospital				
Constant	-1.61	(1.63)	3.12	(1.15)
Age1	0.06	(3.48)	-0.63	(1.03)
Age2	-0.02	(1.47)	0.02	(0.42)
Education	0.20	(4.51)	0.06	(0.25)
Male	-0.69	(2.66)	0.35	(0.38)
Children	0.09	(1.46)	-0.12	(0.40)
Adults	-0.19	(2.59)	-0.75	(1.87)
Healthy Days	-0.11	(6.31)	-0.22	(2.38)
Clinic				
Constant	-1.65	(1.91	3.58	(1.39)
Age1	0.03	(1.65)	-0.06	(1.79)
Age2	-0.01	(0.45)	0.02	(0.42)
Education	0.10	(2.25)	0.12	(1.97)
Male	-0.03	(0.13)	0.43	(0.96)
Children	0.08	(1.34)	0.26	(1.70)
Adults	-0.06	(0.66)	-0.73	(2.38)
Healthy Days	-0.06	(3.64)	-0.23	(5.55)
Sample Size	1254		913	
Log Likelihood	-843		471	

* Variable was divided by 100 for estimation.
** Variable was divided by 100,000 for estimation.

6.3.c Price Elasticities

To show the effect of prices (total costs) on medical care utilization we computed arc price and travel time elasticities. Arc price elasticities of the demand for clinic, hospital, and private doctor care by income quartiles are presented in Table 9 for adults and Table 10 for children. The arc elasticities are calculated for three fee levels, ranging from 0 to 30 intes. Reading down a column of Table 9 or 10 shows the change in the price elasticity moving down the demand curve, holding income constant. Reading across a row of Table 9 or 10 shows the change in the price elasticity as income rises, holding price constant.

The estimates show that the price elasticity of demand falls with income so that poorer individuals are more price sensitive than are richer individuals. Indeed, the price elasticities increase from completely inelastic in the highest income quartile to being into the elastic range in the lowest income quartile, in both the adult and children models. These estimates are commensurate with our results from the Côte d'Ivoire analysis. They imply that user fees can be a significant source of income for the health-care system. They also indicate that user fees will be regressive and may substantially reduce the use of medical care by the poor. Again children's demand for clinic and hospital care is more price elastic than adult demand.

Note that the result that the price elasticity of demand falls with income implies that the willingness to pay for medical care increases with income. This result is very similar to one obtained by Birdsall, et al. (1983). Using a survey technique, in which households in rural Mali were

asked directly how much they would be willing to pay for improvements in health services and water supply, they found the income elasticity of the willingness to pay for these services to be around .35.

TABLE 9: **ARC Price Elasticities by Income Quartile - Peru; Adults**

Range of Price Change*	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)	Overall
Private Doctor					
0-10	-0.53	-0.36	-0.15	-0.00	-0.25
10-20	-0.91	-0.62	-0.25	-2.02	-0.38
20-30	-1.30	-0.87	-0.36	-0.03	-0.49
Hospital					
0-10	-0.57	-0.38	-0.16	-0.01	-0.26
10-20	-0.96	-0.64	-0.26	-0.02	0.39
20-30	-1.36	-0.91	-0.37	-0.04	-0.50
Clinic					
0-10	-0.31	-0.21	-0.08	-0.00	-0.15
10-20	-0.61	-0.40	-0.15	-0.01	-0.27
20-30	-0.95	-0.61	-0.23	-0.02	-0.39
Mean Income*	395	783	1267	2620	1286

* Measured in June 1985 Peruvian Intis.

TABLE 10: **ARC Price Elasticities by Income Quartile - Peru; Children**

Range of Price Change *	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)	Overall
Private Doctor					
0-10	-0.20	-0.16	-0.13	-0.06	-0.14
10-20	-0.44	-0.36	-0.27	-0.12	-0.29
20-30	-0.84	-0.66	-0.48	-0.20	-0.52
Hospital					
0-10	-0.67	-0.48	-0.22	-0.33	-0.41
10-20	-1.18	-0.83	-0.38	-0.05	-0.64
20-30	-1.72	-1.20	-0.54	-0.09	-0.81
Clinic					
0-10	-0.76	-0.53	-0.24	-0.03	-0.46
10-20	-1.28	-0.89	-0.41	-0.06	-0.68
20-30	-1.80	-1.26	-0.57	-0.10	-0.83
Mean Income *	395	783	1267	2620	1286

* Measured in June 1985 Peruvian Intis.

Arc travel time elasticities of the demand for clinic, hospital, and private doctor care were calculated for four ranges of one hour each, covering 0 to 4 hours. They are presented in Table 11 for adults and in Table 12 for children. Unlike Côte d'Ivoire, the travel time elasticities are small relative to the price elasticities. This is not surprising since the opportunity cost of time is a smaller small portion of the total price of medical care in rural Peru. When monetary prices are large relative to the opportunity cost of time, the monetary prices ration the market and time prices are relatively unimportant. In Peru, time costs are, on average, only 3% of the total private doctor price, 25% of the total hospital price, and 21% of the total clinic price. Therefore, we find much less reaction to

changes in travel time, than was the case in Côte d'Ivoire where - in the absence of money prices - the total cost equals the opportunity cost of time lost in obtaining care.

TABLE 11: **ARC Travel Time Elasticities by Income Quartile - Peru; Adults**

Range of Time Change *	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)	Overall
Private Doctor					
0-1	-0.04	-0.02	-0.01	-0.00	-0.02
1-2	-0.07	-0.04	-0.02	-0.01	-0.04
2-3	-0.09	-0.05	-0.04	-0.01	-0.05
3-4	-0.11	-0.07	-0.05	-0.02	-0.06
Hospital					
0-1	-0.03	-0.02	-0.01	-0.00	
1-2	-0.04	-0.03	-0.02	-0.00	-0.02
2-3	-0.06	-0.05	-0.03	-0.01	-0.04
3-4	-0.09	-0.06	-0.04	-0.01	-0.05
Clinic					
0-1	-0.03	-0.02	-0.01	-0.00	-0.02
1-2	-0.07	-0.04	-0.01	-0.00	-0.03
2-3	-0.08	-0.05	-0.02	-0.01	-0.04
3-4	-0.09	-0.06	-0.03	-0.01	-0.05
Mean Income **	395	783	1267	2620	1286

* Time is reported in hours.

** Income is measured in June 1985 Peruvian Intis.

TABLE 12: **ARC Travel Time Elasticities by Income Quartile - Peru; Children**

Range of Time Change *	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)	Overall
Private Doctor					
0-1	-0.04	-0.02	-0.01	-0.00	-0.02
1-2	-0.07	-0.04	-0.01	-0.00	-0.03
2-3	-0.10	-0.05	-0.02	-0.00	-0.04
3-4	-0.12	-0.06	-0.02	-0.00	-0.05
Hospital					
0-1	-0.04	-0.02	-0.01	-0.00	-0.02
1-2	-0.06	-0.03	-0.01	-0.00	-0.03
2-3	-0.09	-0.05	-0.02	-0.01	-0.04
3-4	-0.11	-0.06	-0.02	-0.01	-0.05
Clinic					
0-1	-0.03	-0.01	-0.01	-0.00	-0.01
1-2	-0.04	-0.02	-0.02	-0.00	-0.02
2-3	-0.06	-0.03	-0.02	-0.01	-0.03
3-4	-0.09	-0.04	-0.03	-0.01	-0.04
Mean Income **	395	783	1267	2620	1286

* Time is reported in hours.
** Income is measured in June 1985 Peruvian Intis.

6.4. Summary

In this chapter models of medical care provider choice were estimated using data from the Living Standards Surveys of rural Côte d'Ivoire and rural Peru. The Côte d'Ivoire model had government clinic and hospital care as provider alternatives, whereas the rural Peruvian model included private doctor care as well. These specifications reflect the actual institutional choices available to the population. In Côte d'Ivoire monetary prices were zero so that the market was rationed by the time costs involved in obtaining care from the providers. In Peru time costs were small relative to monetary prices. The models were estimated for children and adults separately. All models yielded similar price and income effects. The estimation results are overall consistent with common sense and economic theory.

Our primary purpose in estimating models of medical care provider choice is to evaluate the impact of charging user fees for government medical care services. In evaluating the effect of user fees, the cost recovery aspects must be balanced against the potential effects on utilization. Indeed, one of the rationales for providing free care is to reduce access barriers and increase utilization. This begs the equity question: are the utilization effects of user fees uniform across income groups? If poorer individuals' decision to use medical care are more price elastic than richer individuals', then user fees will be regressive in that they will reduce utilization of poorer individuals by more than richer individuals.

It is clear, then, that any ex ante evaluation of the user fee proposal requires knowledge of the demand function from which price elasticities can be calculated. Price elasticities provide information about

how user fees will affect utilization and revenues. Our estimates show that price is an important determinant of the decision to use medical care. In addition, we find that the price elasticity of demand falls in absolute value with income. More specifically, we find that demand is very elastic for individuals in the lowest income groups and completely inelastic for individuals in the highest income groups. These results are robust in that we observe them in both the Côte d'Ivoire and Peru models, for both children and adults.

Unlike most previous studies of the demand for medical care in the developing world, our results are quite consistent with the work on the demand for medical care in the developed world. The fact that we had access to high quality data and utilized a model that solves some of the shortcomings in previous studies are probably behind this.

Our bottom line is that user fees have a great potential for cost recovery, but that care must taken in implementing them. Uniform user fees can generate substantial revenues, but are very likely to reduce the utilization of medical care by the poor. Uniform user fees, then, would be regressive in that they act as access barriers to medical care for the poor but not for the middle and higher income groups. In the next section we will be more explicit about the policy implications of these findings, by using them to simulate the effect of introducing alternative health-care fee policies, in poor and better-off regions both in Côte d'Ivoire and Peru.

6.5 Appendix

In this appendix we report the estimation of the reduced form (misspecified) models employed in earlier work on the demand for medical aid in developing countries. The models were discussed in Chapter 5, sections 2 and 3. The purpose of this exercise is to provide results that are comparable to earlier work even though they cannot be interpreted structurally. In these models prices and income are entered linearly and income has alternative specific coefficients. In conjunction with the previous literature, the models are estimated as MNL's rather than as NMNL's. The data used to estimate alternative specific coefficients are described in chapter 6.

The results are presented in Table A1 for Côte d'Ivoire and Table A2 for Peru. It is interesting to note that statistically significant negative price effects are found in all four models. Moreover, income has a positive effect on health care demand and is statistically significant in most cases.

TABLE A.1: **Reduced Form Model of Provider Choice in Rural Côte d;Ivoire**

Variable	Adults Coefficient	Adults t-Statistic	Children Coefficient	Children t-Statistic
Price	-6.121	5.16	-6.055	8.02
<u>Clinic</u>				
Constant	-0.284	0.54	0.813	2.06
Income	0.002	1.84	-0.002	1.83
Age 1	0.012	0.091	-0.274	2.58
Age 2	-0.031	3.34	0.024	0.83
Education	-0.020	0.48	0.003	0.66
Holidays	-0.026	2.98	-0.024	2.02
Male	-0.106	-0.64	0.117	0.68
Children	0.040	1.48	0.057	1.98
Adults	-0.054	1.72	-0.110	2.48
<u>Hospital</u>				
Constant	0.096	0.16	0.653	1.43
Income	0.004	4.04	0.003	3.96
Age 1	-0.010	0.62	-0.338	2.37
Age 2	-0.042	3.93	0.014	0.38
Education	-0.028	0.57	-0.001	(0.08
Holidays	-0.057	5.56	-0.050	3.30
Male	0.0527	2.48	-0.081	0.35
Children	0.040	1.31	0.082	2.23
Adults	-0.068	1.71	-0.126	2.86
Log Likelihood	887.28		674.68	
N	1030		769	

TABLE A.2 **Reduced Form Model of Provider Choice in Rural Peru**

Variable	Adults Coefficient	Adults t-Statistic	Children Coefficient	Children t-Statistic
Price	-4.24	1.98	-8.39	2.25
Doctor				
Constant	-1.46	0.78	2.31	1.87
Income	0.19	1.21	0.35	1.81
Age 1	0.01	0.40	-0.27	1.35
Age 2	0.01	0.38	-0.13	1.77
Education	0.18	2.55	0.04	0.54
Male	-0.27	0.80	0.15	0.32
Children	-0.02	0.21	-0.26	1.86
Adults	0.45	4.29	0.47	2.34
Healthy Days	-0.68	3.27	-0.10	3.26
Hospital				
Constant	-1.95	1.96	1.82	0.99
Income	0.21	3.37	0.22	1.62
Age 1	0.06	3.58	-0.25	1.00
Age 2	-0.02	1.48	0.02	0.31
Education	0.20	4.44	0.01	0.22
Male	-0.68	2.62	0.17	0.48
Children	0.07	1.19	-0.06	0.44
Adults	0.17	2.24	0.28	1.72
Healthy Days	-0.11	6.20	-0.10	2.80
Clinic				
Constant	-1.80	2.08	1.04	1.19
Income	0.13	2.12	0.16	1.11
Age 1	0.03	1.65	-0.27	1.72
Age 2	-0.01	0.46	0.10	0.35
Education	0.10	2.16	0.07	1.90
Male	0.04	0.16	0.27	1.02
Children	0.02	1.19	-0.18	1.76
Adults	0.04	0.48	0.26	2.16
Healthy Days	-0.05	3.61	-0.11	5.51
Log Likelihood	830.83		469.08	
N	1254		913	

CHAPTER 7

Options for Policy Reform

7.1 Introduction

In previous chapters we argued that an ex ante assessment of the feasibility and desirability of introducing or raising user fees for medical care depends critically on consumers' responses to such a measure. More precisely, the potential for fees to generate revenues and the effects of fees on utilization and welfare depend on the price and income elasticities of demand. The major part of our research effort has been to generate reliable estimates of these elasticities.

Our results have demonstrated, among other things, that poorer people are much more sensitive to price changes than are the not-so-poor, so that the effects of price increases are likely to reduce the poors' utilization of medial care by more than the reduction of the population as a whole. How then can these findings be used to judge whether user fees can be introduced as an additional source of revenue, and to determine what fee levels can be set to prevent the poor from being effectively cut-off from obtaining medical care?

In this chapter we attempt to answer these questions by simulating the consequences of alternative price and reinvestment policies in various settings. For instance, in Côte d'Ivoire we try to evaluate whether it is financially feasible to locate a clinic in a poor remote village in the northern Savannah area. For Peru, we evaluate, among other things, pricing

policies for government clinics that take the private sector price responses into account.

The purpose of these simulations is to illustrate how, armed with the appropriate information, one can make rational decisions based on the trade-off between cost recovery and protecting the poor. Though in our examples we try to be as realistic as possible, moving from analytic results to specific policy recommendations requires a comprehensive assessment of the political, cultural and institutional specifics of the countries. These includes aspects of infrastructure, population trends, manpower planning and the fiscal and political environment. Therefore, actual policy should be based on a much more comprehensive analysis than is presented below, and our examples should be viewed as illustrations only and not as authoritative recommendations for the countries under study.

The analysis is limited to the trade-off between cost recovery and access. Our criteria to judge the feasibility and desirability of user fee policies are: (1) the potential for raising revenues,

(2) changes in utilization patterns of medical care, and

(3) the welfare effects on the population, especially the poor

The first part of the chapter simulates various policy scenarios for Côte d'Ivoire, and the second gives examples for Peru. As always, the chapter ends with a brief summary.

In all cases the simulations are conducted by enumerating through the sample data. Two hypothetical villages are chosen from each country: one representing a population from the bottom quarter of the rural income

distribution and a second from the top quarter. Observations corresponding to the hypothetical villages are selected from our samples and used for the respective simulations. The simulations allow all relevant characteristics (education, family structure, wage rate, etc.) as well as income to vary across the villages.

Finally, we need to repeat that our model only incorporates the first visit to a provider. Since our model explains provider choice and not the total number of visits to a provider, we cannot simulate the effects of fees on follow-up visits. Therefore, we need to assume that the fee charged for the first visit covers the cost for the treatment of the entire illness episode, regardless of the number of follow-up visits (i.e. it is tantamount to a "registration fee" customarily charged at clinics in developing countries).

7.2 Policy Options in Rural Côte d'Ivoire

Background

In this section, we simulate the consequences of alternative fee policies in two different settings: a poor village in the Northern Savannah region of Côte d'Ivoire and a wealthier village in the West-Forest region. To make the exercise as realistic as possible, we start the analysis by presenting background information that is directly relevant to the issue at hand.

Rural Côte d'Ivoire can be divided into three regions: the Northern Savannah, and the East and West-Forest. Of the three, the Savannah is by far the poorest and the West-Forest the wealthiest. In the simulations we

consider a Savannah village whose residents would be in the bottom quarter of the rural income distribution in this area. Similarly, we use a wealthier than average West-Forest village (in the top quarter of this income distribution). The characteristics of these communities are given in Table 1. Except for the consumption variables, these characteristics represent average villages in their region.

Per capita consumption levels in 1985 in the relatively well-off West-Forest village (CFA 156,000) were about three times as large as in the poor Savannah village (CFA 60,000). Daily wage rates for agricultural workers in the West-Forest (CFA 700) were more than twice the rates in the Savannah (CFA 300). Virtually, all households in the Savannah are small farmers with three-quarters of them having less than five hectares of land available for cultivation. In comparison, three quarters of the farmers in the West-Forest have more than five hectares and twenty-five percent have over fifteen hectares.

The structure of agricultural production in the two regions is also very different. The major export crop in the Savannah is cotton which is grown by about one-third of the farms. Most of the other agricultural production in the Savannah is food for home consumption and for sale in the local markets. In contrast, the West-Forest is characterized by cocoa and coffee cultivation. These crops are the country's major export and source of foreign exchange. Over 90% of the farms in the West-Forest cultivate cocoa and/or coffee.

The economy of both regions is only partially monetized with a good portion of food consumption produced on the household farm. Health care expenditures are likely to come from the non-food budget which consists of

cash purchases and possibly from the monetized portion of the food budget. In the Savannah, the food share of total household consumption is 70%, leaving only CFA 18,600 per capita for non-food cash expenditures (Table 1). Sixty percent of food consumption is home produced, implying that an additional CFA 17,360 cash per capita is spent to purchase food. Thus, in the Savannah, the total cash budget is CFA 35,960 per capita or about 60% of total consumption.

TABLE 1: **Characteristics of Savannah and the West-Forest Villages**

	West-Forest	Savannah
Agricultural Daily Wage	CFA 700	CFA 300
Per Capita Consumption	CFA 156,000	CFA 60,000
Per Capita Food Consumption	CFA 93,600	CFA 43,400
Per Capita Non-Food Consumption	CFA 62,400	CFA 18,600
Per Capita Cash Expenditures	CFA 109,000	CFA 35,960
% Piped Water	85%	79%
% Latrine or Toilet Facilities	44%	20%
Closest Paved Road (km.)	1 km	9 km
Closest Medical Professional (km)	5 km	22 km
% Ill (last two weeks)	28%	34%
% of Ill Who Obtain Med. Care	45%	37%

Source: 1985 Côte d'Ivoire Living Standards Survey

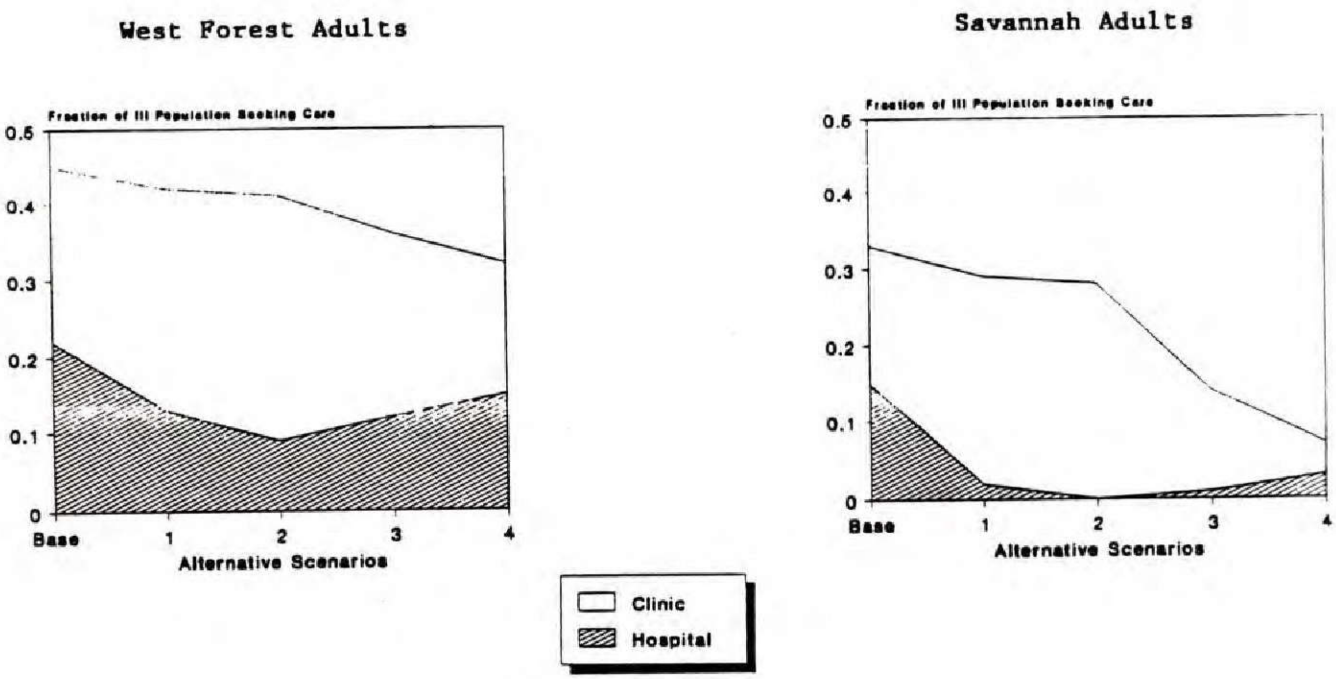
In the West-Forest much more money is available for cash expenditures. The food share is about 60%, leaving about cfa 62,400 per capita for non-food cash expenditures or about three and one-half times what is available in the Savannah. In addition, only 50% of the food budget is home produced, implying that cfa 46,800 cash per capita is spent on food. Total cash expenditure in the West-Forest, then, amount to about cfa 109,200 or about three times the amount spent in the Savannah.

The infrastructure and public health environment of a typical Savannah village reflects the region's relative poverty. Approximately 21% of the households do not have access to relatively clean piped in water and must obtain it from rivers, and 80% of the households have no latrine or toilet facilities. In contrast, only 15% of households in the West-Forest do not have access to clean water, and 56% do not have latrine or toilet facilities. The Savannah is more isolated than the West-Forest as the closest paved road is located, on average, 9 kilometers from Savannah villages, whereas the closest paved road is less than 1 kilometer from West-Forest villages. Moreover, individuals in the Savannah must travel on average 22 kilometers to nearest medical facility, whereas individuals in the West-Forest need to travel less than 5 kilometers on average.

The poor public health environment and poverty manifest themselves in the incidence of illness and medical care utilization. In the four weeks prior to the survey, approximately 34% of individuals living in the Savannah experienced an illness, whereas only 28% experienced an illness in the West-Forest. Of those who were ill, 37% consulted a medical professional in the Savannah, but 45% consulted a professional in the West-Forest.

Another piece of information useful for this exercise is the cost of providing medical care in Côte d'Ivoire. By knowing the cost of care we can evaluate the revenue potential in terms of costs recovered, and we can compare the willingness to pay for improvements in the system, relative to the costs of the improvements. Let us begin with clinic care. Clinics in rural Côte d'Ivoire are usually staffed with one nurse. A typical nurse's salary is CFA 115,000 per month. If a nurse were to spend between 20 and 30 minutes with each patient, a nurse could see about 400 patients a month. Hence, assuming

FIGURE 1: User Fee Simulations; Côte d'Ivoire



this patient load, the average labor cost per visit is CFA 285. In addition to labor, the major source of variable costs is drugs, which come to about CFA 315 per visit (Over 1988). Hence, the average cost per visit is about CFA 600. We will assume that the marginal cost of hospital care is the same as clinic care, while recognizing that hospitals have substantially higher fixed costs.

User Fees Without Reinvestment

As mentioned earlier, clinics and hospitals in Côte d'Ivoire currently do not charge user fees. To investigate what might happen to the utilization of these facilities if the government raised user fees, we consider the following options sequentially:

price scenario (1): raising hospital user fees to CFA 300

price scenario (2): raising hospital user fees to CFA 600

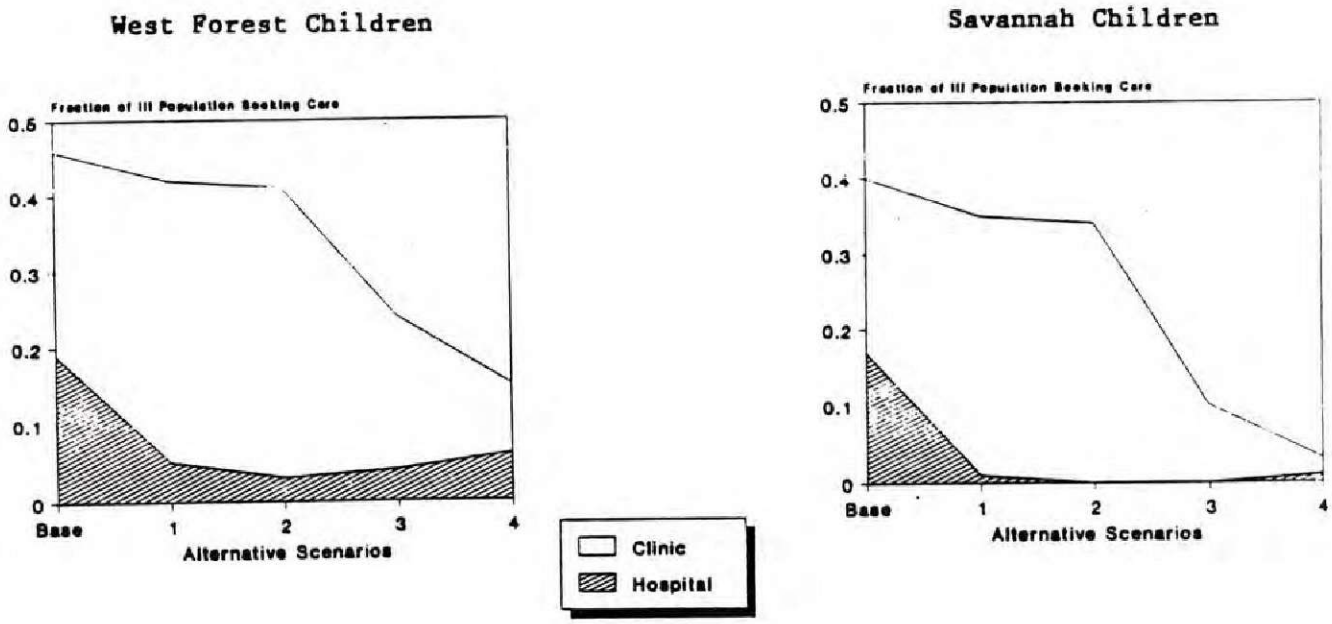
price scenario (3): raising clinics user fees to CFA 300 and maintaining the hospital fee at CFA 600

price scenario (4): raising clinic user fees to CFA 600 and maintaining the hospital fee at CFA 600.

These levels were chosen to correspond to charging approximately half of marginal cost (CFA 300) and all of marginal cost (CFA 600). Thus, at capacity (400 visits) these clinic fee levels correspond to half cost recovery and full cost recovery, respectively.

The results of the policy simulations are pictured in Figure 1 for adults and Figure 2 for children. The estimated fraction of the ill population choosing each alternative for the various pricing schemes is given along the vertical axis for each of the four price scenarios and for the base case with zero fees.

FIGURE 2: User Fee Simulations; Côte d'Ivoire



We begin with the base case where no fees are charged for both hospitals and clinics. This base case corresponds to the actual current situation. In this case, the opportunity cost of travel time rations the market. In the relatively well-off West-Forest village, where per capita income is higher and medical care facilities are closer, the use of medical care is substantially higher. Specifically, 45% of ill adults and 46% of ill children seek medical care, whereas in the poor Savannah village only 33% of adults and 40% of children seek care.

The response to price rises differs dramatically between these two hypothetical villages. At full cost recovery for hospitals (CFA 600), the number of adults in the West Forest seeking care is about 41% or a fall of about 9%, whereas adult utilization in the Savannah village falls to 18%, or a reduction of about 55%. Similar relative responses are observed for children as well. When fees are increased to full cost recovery levels in clinics (CFA 600) as well as in hospitals, both adults and children are effectively priced out of the market in the Savannah as utilization of adults drops to 7% and children to 3%, whereas in West-Forest 32% of adults and 15% of children still seek care.

One of the advantages of the nested multinominal logit specification is that it allows cross-price elasticities to differ across alternatives. Notice in Figures 1 and 2 that as we begin to increase the hospital fee most of the reduced hospital demand shifts to clinic care as opposed to self-care. Hence, user fees at hospitals can shift demand to clinics without substantial reductions in total utilization.

It is interesting to note that at zero prices children's utilization rates are about the same as adults' in both the West-Forest and the

Savannah. Then, as prices rise, children's' demand falls faster than adults' so that at full cost recovery prices, children's' utilization is lower than adults.

Earlier in the discussion we implied that a fee of CFA 600 would generate enough revenues to cover the variable costs of clinic care. This of course relied on the assumption that there would be approximately 400 visits per month, i.e. enough visits to cover one full-time nurse's salary plus the cost of drugs. For planning purposes it is important to take into account the aggregate demand response to determine if there is sufficient utilization. The question is, then, what size communities will support clinics at the various cost-recovery levels. From the information on the probabilities of seeking care and the probabilities of experiencing an illness reported in Table 1, we can derive the approximate population necessary to generate 400 visits to a clinic. These are reported in Table 2 for the three fee levels: zero cost recovery, half cost recovery, and full cost recovery. These estimates were derived under the assumption that hospitals charged a user fee of CFA 600.

TABLE 2: Population Necessary to Generate 400 Visits

	Hospital Price	Clinic Price	Population West-Forest	Population Savannah
Zero Cost Recovery	600	0	1,750	3,650
Half Cost Recovery	600	300	1,900	8,100
Full Cost Recovery	600	600	2,850	20,300

At zero cost recovery a population of about 1,750 in the West-Forest and about 3,650 in the Savannah would support a clinic. At fees levels that would cover about half of costs, the population necessary to support a clinic in the Savannah is about four times the size in the West-Forest, and for full cost recovery the Savannah population has to be seven times bigger. The large differences in the population necessary to support a clinic reflect the dramatic differences in utilization rates in the two regions at the CFA 300 and CFA 600 fee levels.

User Fees With Reinvestment

As discussed earlier, when monetary prices are low the opportunity cost of time rations health care demand. Typically, medical care facilities are located much closer to patients in the wealthier regions (urban) than in poorer regions (rural). In rural Côte d'Ivoire, individuals living in the West-Forest travel on average less than one-half hour one-way to a clinic, whereas Savannah residents must travel more than one and one-half hours on average. Thus, a uniform fee schedule implies a regressive pricing policy even at zero monetary cost.

In this section, we evaluate the effect on consumers' welfare of the proposal to locate clinics in villages the currently have no facilities and then charge user fees for access. The benefit to individuals from implementing this proposal depends on whether the reduction in welfare resulting from having to pay user fees is less than the improvement in welfare from having access to medical care facilities within the village. The welfare neutral fee is the amount consumers would be willing to pay not to have to travel (i.e. the compensating variation). If the welfare neutral fee is more

than the marginal cost of medical care, the policy is welfare improving. On the other hand, if the welfare neutral fee is less than the marginal cost, then the policy would reduce welfare.

The welfare neutral prices are derived from compensating variation experiments. Three welfare neutral prices are calculated for an average individual in each of the two hypothetical villages; how much an individual is willing to pay not to have to travel to a free clinic that is currently 1 hour away, 2 hours away, and 3 hours away. The experiments are conducted assuming that the closest hospital is 4 hours away and charges a user fee of CFA 600.

The welfare neutral prices are reported in Table 3. Reading across a row shows the change in willingness to pay as it depends on the current distance to the clinic. Of course, the welfare neutral prices increase with this distance for both children and adults in both villages. West-Forest residents are willing to pay one and one-half times as much as adults in the Savannah. The welfare neutral fees are 5% and 15% of the marginal cost of providing clinic care. Hence, implementing the proposal to locate clinics in villages and charge users marginal costs will lead to a reduction in welfare. For the policy to be welfare improving, a subsidy of approximately 90% is required.

Before drawing the most important policy implications of these results, we will simulate the outcome of a similar set of policy alternatives for two hypothetical villages in Peru.

FIGURE 3: User Fee Simulations - Peruvian Adults

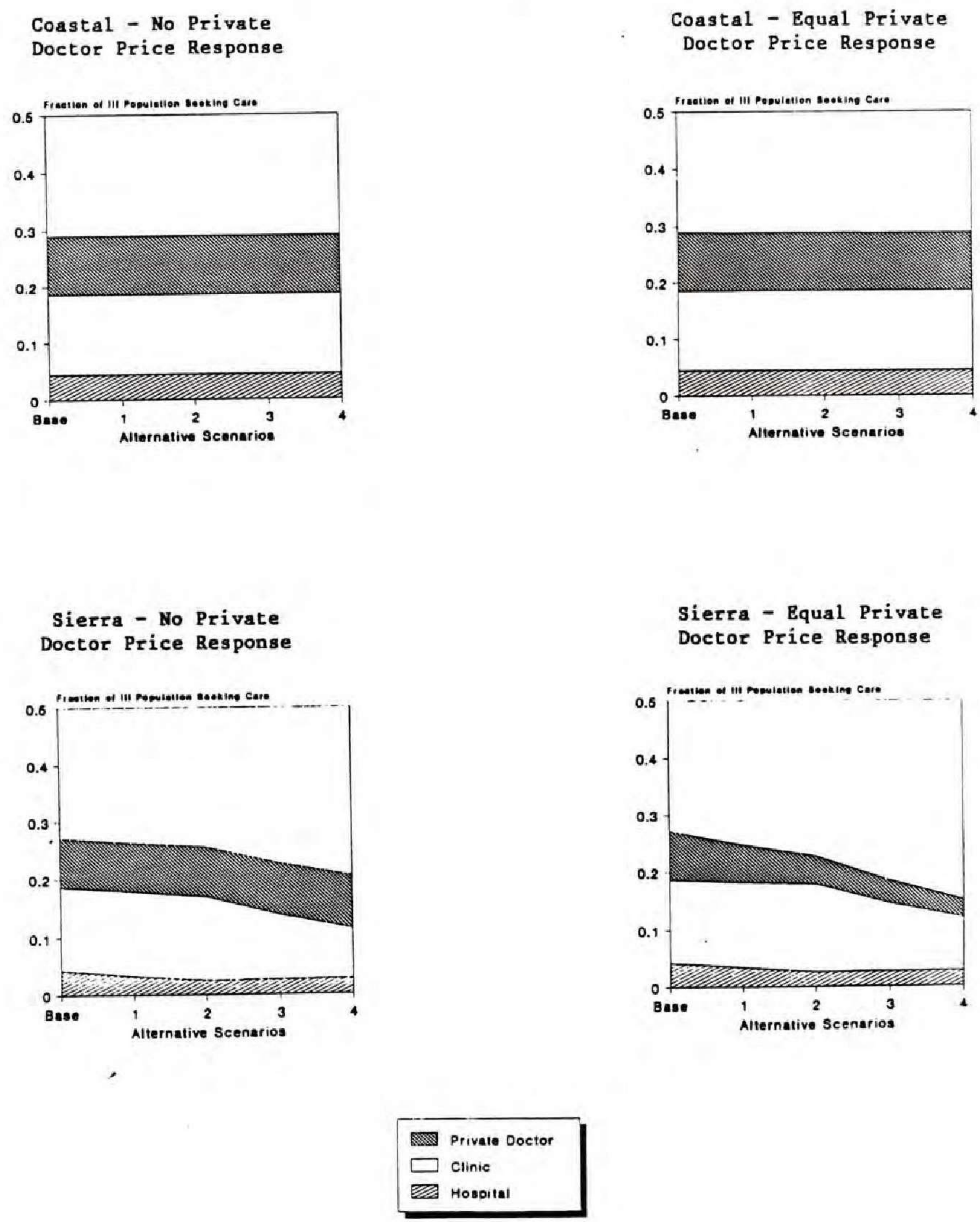


FIGURE 4: User Fee Simulations - Peruvian Children

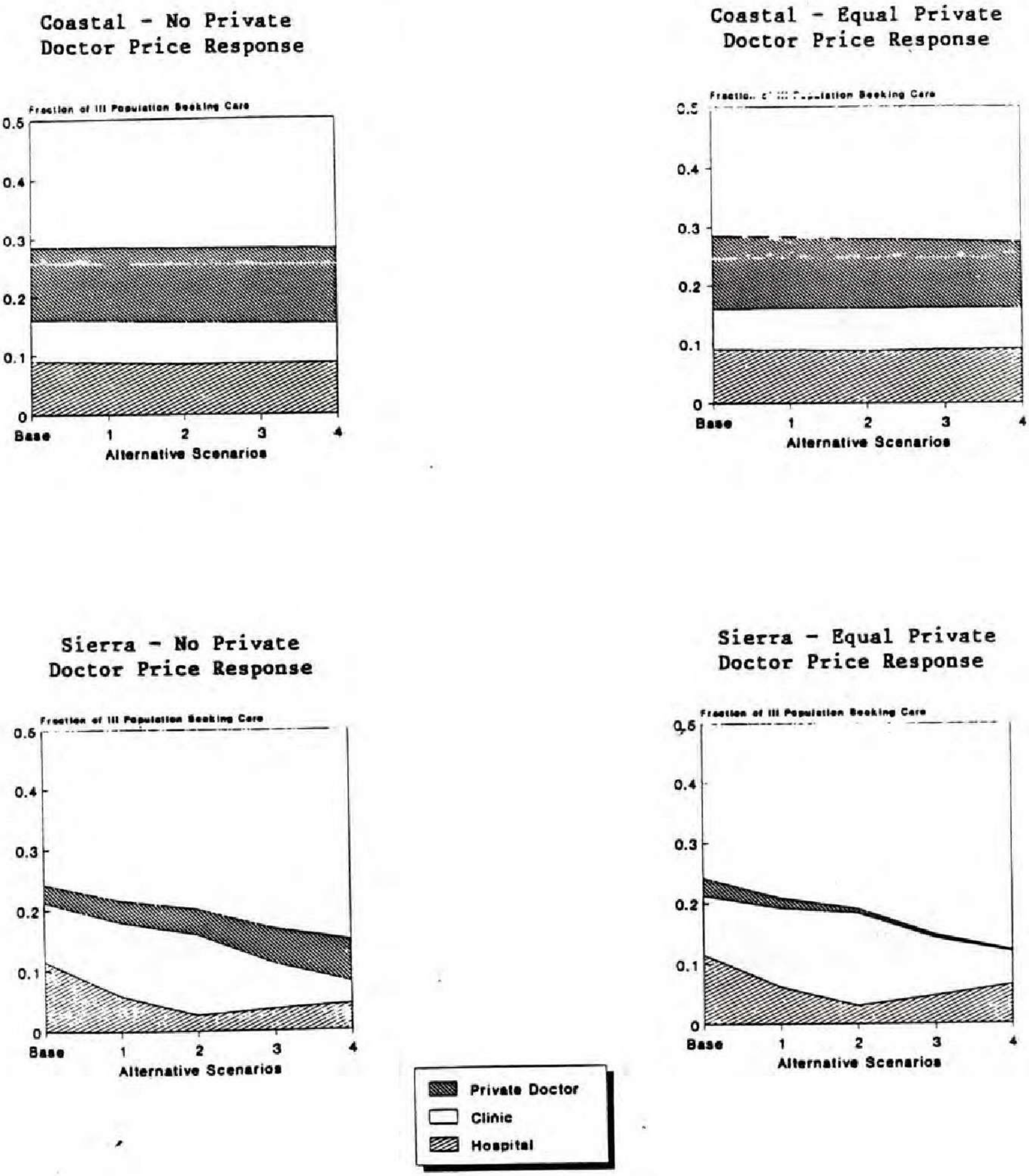


Table 3: **Willingness to Pay (CFA) For Reduced Travel Time**

	Travel Time to Clinic		
	1 Hour	2 Hours	3 Hours
West-Forest Adult	46	62	78
Savannah Adult	16	22	27
West-Forest Child	28	46	57
Savannah Child	14	19	38

7.3 Policy Options in Rural Peru

Peru can be decomposed in three large regions: the Forest, the Sierra, and the Coast. Of the three the Sierra is by fare the poorest and the Coast the richest. Residents of the Sierra are among the poorest in the world and their incomes are similar to that of residents of the poorest regions in Côte d'Ivoire. On the other hand, residents of the Coast are quite well off and indeed are much wealthier than residents of the West Forest region in Côte d'Ivoire. In this section we will simulate the likely effects of various user fee policies in two hypothetical villages: a poor village in the Sierra whose residents are in the bottom quarter of the rural Peruvian income distribution, and a wealthy village on the Coast whose residents are in the top quarter of that income distribution.

The characteristics of these two villages are presented in Table 4. The differences in wealth are apparent. Average agricultural workers' daily wage rates in the Coast are twice those in the Sierra, and per capita annual consumption in the Coast (2520 intis) is approximately two and one-half times per capita consumption in the Sierra (960 intis). In the poorer Sierra, about

76% of total consumption is spent on food, leaving only 230 intis per capita. In the Coast, only 60% of the total consumption is spent on food, or - in absolute value - over three times what is spent in the Sierra.

The infrastructure and public health environment reflects the relative poverty of the Sierra as well. Only 10% of households in the Sierra have access to relatively clean piped in water, and the rest must obtain it from rivers and streams. In the Coast, 58% of households have piped in water. Only 31% of households have latrine or toilet facilities in the Sierra, whereas 41% have these facilities in the Coastal area. Moreover, the closest medical facility is 4 hours travel time on average from Sierra households, and only 1.25 hours from Coastal households.

These differences manifest themselves in morbidity rates and in the utilization of health care. In the Sierra, approximately 43% of all individuals experienced an illness in the four weeks prior to the survey, and 24% of them sought formal medical attention. On the other hand, only 30% of Coastal residents experienced an illness, and 30% of them sought formal medical attention.

TABLE 4: **Characteristics of the Sierra and Coastal Villages**

Variable	Sierra	Coast
Daily Ag. Wage Rate	1.3	2.6
Per Capita Total Consumption	960	2520
Per Capital Food Consumption	730	1590
Per Capita Non-Food Consumption	230	930
% Piped water	10%	59%
% Latrine or Toilet Facilities	31%	41%
Closest Medical Professional	4 hrs	1.25 hrs
% Ill (last four weeks)	43%	30%
% of Ill Who Obtained Med. Care	24%	30%

Finally, we need information on the recurrent costs of medical care. Data from the PLSS indicate that a nurse's monthly income is about 1000 intis on average. Assuming approximately 400 visits per month, this implies an average labor cost of about 2.5 intis per visit. Drugs costs for respiratory and digestive problems average 15 intis (Gerrafi, 1987). This amounts to an average cost of about 17.5 intis per visit.

User Fees Without Reinvestment

Currently, government clinics and hospitals charge small user fees - from 1 to 5 intis depending on the region. In this section we evaluate the likely effects of increasing user fees to half and full cost recovery levels. Unlike Côte d'Ivoire, Peru has a large private sector. Increases in prices at government facilities are likely to shift demand to the private sector. The increased demand may cause private doctors to increase their prices, and consequently further reduce the number of ill individuals that

obtain medical care. Thus, a complete evaluation of user fees requires one to take into account the private doctor supply response. Unfortunately, we have no information about the slope of the private doctor supply function. Therefore, we will consider two extreme scenarios under the belief that the likely scenario is somewhere in between. The two scenarios are: no private doctor price response, and an increase in private doctor prices equal to the increase at public facilities.

We first consider the impact of charging user fees at hospitals and consider the effects of extending them to clinics. Again we consider fee levels at the half and full cost recovery levels. We begin by simulating a base case in which clinic and hospitals charge zero fees. It is important to note though that this is not reflective of the current situation as government facilities currently charge small fees. The user fee simulations are:

Price Scenario (1) raising hospital fees from 0 to 7.5 intis

Price Scenario (2) raising hospital fees from 7.5 to 15 intis

Price Scenario (3) maintaining hospital fees at 15 intis and raising clinic fees from 0 to 7.5 intis

Price Scenario (4) maintaining hospital fees at 15 intis and increasing clinic fees from 7.5 to 15 intis.

These user simulations are performed twice: once assuming that the private sector does not respond at all to changes in the price of public health services. The second set of simulations assumes that private doctors raise their prices by an amount equal to the increase in public facility fees. The results of the policy simulations are reported in Figures 3 and 4, which show

the faction of the ill population that obtains medical care from each of the available alternative providers, including self-care, for each of the above price scenarios.

The base-case in Figures 3 and 4 refers to the situation under which hospitals and clinics do not charge a user fee. In the base-case, 29% of adults and children from the relatively well-off coastal obtain professional medical-care to treat an accident or illness. In the poorer Sierra village, 27% of adults and 24% of children seek professional medical-care.

As was that case for Côte d'Ivoire, the utilization response to increase in user fees is dramatically different in the two villages. The figures show that charging user fees at full cost recovery levels at both hospitals and clinics has negligible effects of the utilization of professional medical care by both adults and children from the Coastal village. On the other hand, raising user fees in the Sierra clinic and hospital does have large utilization effects. Let's begin with the scenario in which there is no private doctor price response. Under this assumption, an increase in fees in the Sierra region to full cost recovery level at hospitals (price scenario 2), reduces adult hospital demand by about 42% and children's demand by about 76%. Total adult medical care utilization falls by about 6% and total children's utilization falls by about 16%. An additional increase in clinic fees to full cost recovery levels (price scenario 4) reduces adult clinic demand by 39% and children's' clinic demand by 62%. Moreover, at full cost recovery fee levels total adult demand falls by 24% and total children's' demand falls by 38%. Under the assumption of equal private doctor price response the reduction in total utilization is even larger. At full cost recovery fee levels (price scenario 4) total adult demand is reduced by 44% and total children's demadn by 46%.

Now we calculate the population base necessary for a clinic to be financially self sufficient. Table 5 reports the population necessary to generate 400 clinic visits a month under the various price scenarios. We begin with full cost recovery fees at hospitals and zero fees at clinics. Notice that the population base in Sierra is smaller than in the Coast for the first two price scenarios. This because the probability of developing an illness is greater in the Sierra than on the Coast. Another interesting point is that the population bases at the lower coast recovery scenarios are larger than in Côte d'Ivoire. This is because both the illness probabilities and utilization rates are higher in Côte d'Ivoire than in Peru.

TABLE 5: Population Necessary To Support A Clinic

	Coast No Price Response	Coast Equal Price Response	Sierra No Price Response	Sierra Equal Price Response
Price Scenario 2	17,400	17,100	9,600	8,800
Price Scenario 3	18,100	17,300	15,000	12,700
Price Scenario 4	18,[illegible]0	17,400	26,200	20,300

User Fees with Reinvestment

In this section we investigate the feasibility of improving access to clinics by reducing travel time and charging users the recurrent cost of operating the new facilities. In this way we can evaluate the possibility that increased access to medical care can be self-financed by users. Again we do so by calculating the welfare neutral fees. Which are the prices which people are willing to pay to avoid traveling long distances to obtain medical care. Recall that the willingness to pay is calculated as a compensating variation using the formulas derived in the previous chapter. Three welfare neutral prices are calculated for an average individual in both villages: the amount an individual is willing to pay not to have to travel 1 hour, 2 hours and 3 hours to a clinic, respectively. The experiments are conducted assuming that the closest hospital is 4 hours away and charges a user fee of 15 intis, and a private doctor is 2 hours away and charges 20 intis.

The welfare neutral prices are reported in Table 6. Reading across a row indicates the change in the welfare neutral price as the travel time rises, and reading down a column indicates how the price changes as income rices. Residents of the Sierra village are willing to pay almost nothing to avoid traveling, while residents of the Coastal village are willing to about

10% of the recurrent costs of operating a clinic.

Table 6: **Willingness To Pay For Reduced Travel Time To A Clinic**

	1 Hour	2 Hours	3 Hours
Coastal Adult	.56	1.07	1.54
Sierra Adult	.00	.01	.02
Coastal Child	1.01	1.94	2.80
Sierra Child	.03	.06	.09

7.4 Conclusion; Policy Implications

In this section we used the estimated demand functions from the previous chapters to simulate the likely effects of various user fee policies in two hypothetical villages in the two countries under study: one poor village and one richer village in each country. Though both countries are very different, the simulation results are quite similar. The results indicate that user fees at half and full marginal cost levels would effectively price residents for the poorer communities out of the medical care market. Alternatively, user fees at these levels do not seem to substantially deter medical care utilization by residents of the wealthier village. Thus, it appears that user fees are a potential source of substantial revenues for the health-care sector, but poorer communities need to be protected from the adverse effects on utilization of the implementation of substantial fees.

Two other simulation results have immediate policy implications. First, charging fees for higher levels of care (e.g. hospitals) clinic care, generally causes individuals to substitute to other types of care rather than to drop out of the medical care market. Secondly, user fees seem to have a greater negative effect on childrens' utilization of medical care than on adults'.

. The simulation results on charging fees while reducing travel time to zero, show that this policy would substantially reduce welfare and utilization both in the richer and poorer villages. Hence, this (extreme) type of expansion of the health care system in rural areas cannot be completely user-financed and requires about a 90% subsidy to be welfare improving.

Finally, let us place these results in a family budgetary context. Given the probabilities of experiencing an illness, the probabilities of seeking medical care, and the cost of care, we can derive the ex ante subsidy provided to an individual when medical care is provided free of charge. Zero user fees imply an annual subsidy of about CFA 1,460 per capita in the wealthier Ivorian villages and CFA 960 per capita in the poorer village. The subsidy amounts to 0.9% of the total budget for wealthy families and about 1.6% of the total budget for poorer families. Since medical care is likely to be purchased at the expense of non-food items, the budget shares become even larger. The subsidies amount to 2.3% of non-food expenditures for wealthy families and 5.2% poorer families.

For Peru the annual per capita subsidy to residents of wealthier villages such as our Coastal example is 30 intis, while the subsidy to residents of poor villages such as our example from the Sierra is 43 intis. This amounts to 1.2% of total consumption for the wealthier family and 4.5 of total consumption for the poor family. With respect to non-food expenditures, this amounts to 3.2% of the non-food budget for the wealthy families whereas the subsidy to the poor is about 18.7%. Our results can be summarized by pointing out the people who are willing to pay 2% to 3% of their non-food budget for medical care, but are not willing to pay 5% or more.

CHAPTER 8

Conclusion

8.1 Some Collaborative Evidence for the Main Results

The main analytical result of this study is that the demand for medical care is responsive to price changes. Moreover, the price elasticity of demand falls with income. The result that demand is price responsive is in accordance with most of the literature on developed countries as well as with a few recent studies on the developing world (Cretin et al., 1988; Alderman and Gertler, 1988 and Mwabu, 1988), but contrast sharply with earlier studies on the demand for medical care in LDCs. Indeed, a review of this early evidence on price responsiveness led to the conclusion that prices are not relevant in the decision to seek medical care (World Bank, 1987). In our review of the literature in chapter 5 we presented various reasons for this negative, and - given the evidence available from developed countries - paradoxal finding.

All studies mentioned, including our own, draw their conclusions from the statistical analysis of cross-sectional sample data. Observing the behavior of households and individuals who currently face different prices and other access costs, demand equations are postulated and estimated and the obtained coefficient for the price effect is statistically tested against the null-hypothesis of a zero price effect. Ideally, one would like to conduct various experiments in which alternative price regimes are being implemented and before and after utilization patterns compared. Given that this is

conceptually straightforward, the lack of such experiments is surprising. In fact, we were able to find just one study that reports on such a before and after evaluation.

Dr. Enyimayew, in a paper presented at the WHO Workshop on Financing Drug Supplies held in Zimbabwe March 1988 (Enyimayew, 1988), reports results from the Ashanti-Akim experience in Ghana. After the introduction of user fees in 1985, attendance dropped to one-quarter of the previous level. In the larger urban-based health stations attendance recovered quickly, but 2½ years after the introduction of user fees, small rural based stations that serve primarily the poor see only a fraction of the patients they saw before and operate at less than half of their optimum level (op. cit. p.11-a). This result is strikingly similar to the simulation results presented in Chapter VII: user fees can be introduced in relatively well-off regions without having a major impact on health-care utilization, but user fees will constitute an effective access barrier to medical care for the poor.

Other collaborative "real world" evidence for our analytical findings is more anecdotal. For instance, Dunlop in a study on Ethiopia reports that revenues for outpatient care actually decreased after a fee increase was implemented, implying that the price elasticity of demand exceeds - 1.0 in absolute value (Dunlop, 1987). However, this study also reports arc price elasticities of between .05 and .50, so the evidence is mixed, except for the fact that demand is sensitive to prices. Bao (1987) reports that about half of the ill peasants in Hubei Province, China, who do not obtain medical care, report the high price as the major deterrent. Two thirds of the poor in the mountainous areas say not to seek care because the price is too high.

In sum, we are quite confident that our main findings are correct and should be taken seriously by those who propose to charge user fees as a means of generating revenues for health-care delivery. At the end of this chapter we will summarize the policy implications of our findings. But first we will draw attention to some of the shortcomings of our study and thus, inter alia, sketch an agenda for future research.

8.2 Suggestions for Future Research

The most obvious next steps necessary to improve our understanding of the determinants of the demand for medical care would involve an extension of the model we used into a more detailed investigation of the determinants of more specific aspects of health-care utilization. The extension is necessary since we restricted the analysis to the choice of provider only. It is conceptually straightforward to include the total number of visits, as well as outlays for follow-up consultations. We would also have liked to be more precise about the total access costs, including, for instance, out-of-pocket transportation costs. The data requirements for such an extension are large, but not prohibitively so. A carefully prepared household survey focusing on health and medical care utilization could incorporate questions to obtain such information.

It will be somewhat more difficult - but not less important - to become more specific about exactly what is meant by "the demand for medical care". For instance, the willingness to pay for preventive care is probably quite different from the willingness to pay for curative care. The price elasticity of drugs and the demand for care for chronic diseases will differ

from acute care, emergency care and for maternal and child health care. Our study focussed on the demand for acute primary outpatient care. Subsequent research should focus on specific types of medical care. This, by itself, does not cause any conceptual difficulties. It does imply, though, that much more attention needs to be paid to the measurement of health status. Self reported health status (days lost for normal activities due to an illness or injury) is likely to contain insufficient information if one is interested in explaining the choice between, say, visiting a mid-wife or a hospital emergency clinic.

Others would argue that health status should be treated as endogenous (e.g. Strauss, 1988). While this is theoretically correct, we did not find any impact on our estimation results when removing "endogenous" health status measures. Again, this issue may become very difficult to deal with empirically if health-care type specific demand equations are being estimated using illness specific health status measures. This analysis requires a longitudial design where patients are followed over time so that specific investments (use of medical care) can be evaluated on their effect on future improvements in health.

There are various aspects related to the main issue of health-care financing through user fees that we have not adequately addressed and that, we think, deserve high priority from the health-economic research community.

The first one relates to the effect of the quality of care (e.g. the amount of training received by the doctor; the availability of drugs and diagnostic equipment) on the demand for care. The demand equation may shift if the quality of the services provided increases. If such a shift is large enough, it may offset the negative effect on utilization of an increase in the

price of care. This is an empirical question that can and should be researched using provider-specific data in conjunction with household survey data.

The second issue relates to the responses of the private sector to pricing policies in the public health-care sector. As we demonstrated in the policy simulations for Peru, potential revenues for the public sector may "leak" to the private sector if fees for government clinics are raised. Though this is not necessarily a negative development (it may for instance free an over-burdened public sector to focus on providing care to the poor) it may have significant consequences in terms of revenues raised. A better understanding of the the private sector supply responses in the health-care sector (will the private sector increase its price in response to the increase in demand? Or will it expand its facilities?) is necessary to come to a more complete judgment about the feasibility of financing medical care through user changes.

Finally, we feel that much more work can be done to better target public health-care facilities to benefit the poor. Even in a relatively small country like Côte d'Ivoire, regional differences in welfare levels are relatively large. Given our simulation results, it does make sense to subsidize medical care in such areas as the Savannah in Côte d'Ivoire and the Sierra in Peru. At the same time user fees can be introduced in the better-off areas without large negative effects on utilization. If welfare differences are very large, some form of cross-regional subsidization may become a desirable and feasible option. But more can be done in this area.

One way to protect the poor is to provide them with health-insurance. Very little analytical work is being done in this area since

targetting the poor is very difficult without a reliable income reporting system, and these systems do not exist in many developing countries. But, for example, in countries where governments have created a monopoly on export crops grown by small farmers, one could think of earmarking a tiny percentage of the revenues of these crops for providing health-care insurance to these farmers. For the case of Côte d'Ivoire, this would especially be beneficial to a large group of the poor, if the emphasis was on cotton growers. Alternatively, just as one can think of regional variation in subsidizing health-care delivery, one can imagine region-specific (or even village-specific, say, based on export crop production) subsidies for health insurance schemes. Clearly, the ramifications of such policies need to be worked out further, but the examples suggest that there are many alternatives to the customary across-the-board subsidy schemes that, in practice, always turn out to be regressive. More analytical work in this area is needed, as well as more innovative real world experimentation.

8.3 Suggestions for Policy Implementation

We conclude by listing the four most important findings of our study and providing some suggestions on how - given these findings - user fee policies can be implemented while trying to protect the poor.

- the demand for medial care is price sensitive
- the poor are more price sensitive than the rich
- child care is more price elastic than adult care
- alternative health-care providers are closer substitutes than health-care providers and self-care.

Do these results imply that user fees should not be introduced as a source of revenues for the health-care sector? Not at all. Demand overall is price inelastic with an order of magnitude about -.2 to - .4, implying that increases in prices will raise substantial revenues. In addition, there are many good reasons other than resource mobilization for reintroducing price signals in the health-care system (e.g. World Bank, 1987). What the results imply is that just as providing medical care free of charge to the entire population is an unattainable and regressive policy, so will the across-the-board introduction of user fees be regressive and - in poor areas - unattainable.

The first result, that the demand for medical care is responsive to price changes, has straightforward implications for revenue potential: since the demand for medical care will fall if prices are raised, revenues will be lower than without a price response. This is particularly the case if there are close substitutes for public facilities (private care).

The second result implies that the revenue potential in poor areas is very low. Clinics in poor areas can not survive financially unless they are heavily subsidized. The poor's willingness-to-pay for medical care is so low that they are effectively being priced out of the market by fees that are even just a fraction of marginal costs. Our results indicate that fees can be charged without a significant drop in utilization if the cost of medical care takes no more than 2 to 3 percent of the household's non-food budget. Though we are hesitant to prescribe this number as a rule of thumb, it does suggest that the estimated budget share for medical care can give a first indication about the feasibility level of user fees. The practical implication of these results is that uniform user fees are regressive and that some sort of price

discrimination is necessary to simultaneously achieve cost-recovery and equity goals. In countries without good income records, targetting the poor for price discounts is administratively difficult. One immediate alternative is geographic price discrimination: Charge lower prices for facilities that primarily serves low income groups. In addition, policy makers may want to opt for the gradual introduction of user fees, starting at a level that will result in expenditures of no more than about 2 percent of the household non-food budget. Careful evaluation of the changes in utilization patterns resulting from such charges should provide guidance for subsequent policies regarding the fee levels. Of course, such an approach implies that fees in poorer areas have to be set well below those in better-off regions.

If our third result, that child care is more price sensitive than adult care, holds up to further scrutiny, it contains again a strong warning against the across-the-board introduction of user fees. Clearly it would be penny-wise and pound-foolish for a developing country not to invest in the health of its younger generation. With human capital formation one of the driving forces of economic development, there is much to be said for providing medical care to children who need it. It would be logistically simple to exempt child-care from increases in the fee structure for medical care, or at least to differentiate between fees for child health-care and adult care. The humanitarian argument would make such a differentiation politically feasible. If our results turn out to be generally true, such a policy would also make good economic sense.

Our final result, that the increase in the price of one provider is more likely to lead patients to turn to another provider rather than to opt for self-care providers, provides another suggestion for a differentiated

introduction of user fees in the health-care system. The result suggest that one should start to charge for higher levels of care (say, hospitals). If, after the introduction of, or increase in fees, the demand for hospital care decreases significantly, while the demand for clinic care increases, any increase in the charge for clinic care is likely to result in an overall reduction of medical care utilization. If, on the other hand, the demand response to the hospital fee is modest, one can experiment with a gradual introduction of fees in the lower echelons of the health-care system.

The overall message to policy makers is thus one of gradation and differentiation. The best policy advice will be derived from carefully monitoring the impact of real world experiments. The selective introduction of modest fees, followed by a careful evaluation of the resulting changes in health-care utilization patterns, will provide the policy guidance for subsequent fee policy measures or for corrective actions.

In the early chapters of this book we underscored the importance of health in the development process. We highlighted the poor state of the existing health-care infrastructure and joint the numerous analysts and policy makers who point at the need for more financial resources to improve the situation. Given the current economic climate and the tight fiscal policies many LDCs have to follow to return to a path of sustained economic growth, additional financing is unlikely to come from government resources. Are user fees the answer? This study has shown that, in general, user fees can generate significant revenues, if introduced carefully. The best policy is likely to be one that starts with charging modest fees for higher level care. Fees approaching the marginal cost of care, however, will effectively

cut the poor out of the health-care market. Thus, large subsidies continue to be necessary for providing medical care to the poor.

In the past many countries have opted to eliminate all financial barriers to obtaining medical care. This has lead to a resource-starved health-care system in which the limited supply of services is rationed by non-price mechanisms. In spite of all the good intentions, the result is a highly inequitable, regressive distribution of public health services. User fees can significantly increase the resources necessary for improving the health-care system. If these fees are introduced in a differentiated way, the policy can at the same time generate revenues and improve the equity of the system. On the other hand, if no special measures are being taken, a user fee policy will perpetuate the inequitable distribution of health-care in the developing world.

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Already Evaluated

RPO#	DEP/DIV	TITLE	P.I.	PCR DATE
673-38	PHR	Health Care Demand & Resources Mobilization: The Case of Peru *	van der Gaag	10/4/88

Output

LSMS Working Paper Series

No. 35 Dor, Avi & J. van der Gaag. "The Demand for Medical Care in Developing Countries." May 1987

No.37 Dor, Avi, Locay, Luis, Sanderson, Warren, Gertle, Paul & J. van der Gaag "Health Care Financing and the Demand for Medical Care." May 1987.

NO. 31 Suarez-Berenguela, Ruben M. "Financing the Health Sector in Peru. April 1987

No. 45 Gertler, Paul and J. van der Gaag. "Measuring the Willingness to Social Services in Developing Countries." May 1988.

Gertler, Paul and J. van der Gaag "The Willingnes to Pay for Medical Care.". Book manuscript. October 1988.

LSMS No. 35 to be published in Journal of Health Economics

LSMS No. 37 to be published in Journal of Econometrics and Journal of Health Economics.

* Evaluation Group: Population and Health

RPO#	DEP/DIV	TITLE	P.I.	PCR DATE
673-38	PHR	Health Care Demand & Resources Mobilization: The Case of Peru *	van der Gaag	10/4/88

Output

(9-88)

evaluated

WORLD BANK RESEARCH PROGRAM
COMPLETION REPORT

PROJECT'S CLOSING DATE: 12/31/87

DATE OF SUBMISSION OF COMPLETION REPORT: ~~10/31/88~~ 11/8/88

PREPARED BY: J. van der Gaag

I. PROJECT IDENTIFICATION

1. TITLE
Health Care Demand and Resources Mobilization: The Case of Peru

2. PROJECT NUMBER: 673/38

3. DEPARTMENT: Population & Human Resources

4. DIVISION: Welfare & Human Resources

5. STAFF PARTICIPATION:

(a) Principal Supervisor(s):* J. van der Gaag (3/85)

(b) Others Responsible:

(c) Administrative/Budgeting Officer: Brenda H. Rosa

6. CONSULTANT(S) (list names, nationalities, and affiliations):
Avi Dor. Israeli - Long-term consultant at Bank
Paul Gertler. American - Harvard School of Public Health
Ruben Suarez. Peruvian - in business on own account.

7. OTHER OUTSIDE COLLABORATOR(S) (list names, nationalities, and affiliations):

II. DEPARTMENTAL APPROVAL

DIVISION CHIEF'S NAME *(Please type)*: J. van der Gaag	SIGNATURE:	DATE: 10/31/88
DEPARTMENT DIRECTOR'S NAME *(Please type)*: Ann O. Hamilton	SIGNATURE: Ann O. Hamilton	DATE: 10/4/88

* If changed indicate date(s).

III. FUNDING ($ thousands)

FISCAL YEAR	RESEARCH SUPPORT BUDGET AUTHORIZATIONS			BANK		OUTSIDE		TOTAL
	Initial (1)	Supplementary (2)	Total (3) = (1) + (2)	Department (4)	Amount* (5)	Organization (6)	Amount (7)	(3) + (5) + (7)
FY 84	9.2		9.2	PHN	- 2.7			6.5
FY 85	116.0		116.0					116.0
FY 86	45.3		45.3					45.3
FY 87	11.3		11.3					11.3
FY								
TOTAL	181.8		181.8					179.1

IV. ACTUAL EXPENDITURES ($ thousands)

FISCAL YEAR	RSB PROJECT NO. 673/38 (1)	BANK* (2)	OUTSIDE (3)	TOTAL (1) + (2) + (3)
FY 84	0.4			0.4
FY 85	91.9			91.9
FY 86	19.7			19.7
FY 87	46.1			46.1
FY 88	15.2	15.1		30.3
TOTAL	178.3	15.1		193.4

APPROVED BY RESEARCH ADMINISTRATOR (print name)	SIGNATURE	DATE
Dennis de Tray		

*Do not include staff time cost equivalent in these columns.

V. OUTPUT AND DISSEMINATION

1. REPORTS - Publications and reports from project (please provide full references for each.)

Health Care Demand and Resource Mobilization (RPO 673/38)

Output
LSMS Working Paper Series

No. 35. Dor, Avi and Jacques van der Gaag. "The Demand for Medical Care in Developing Countries." May 1987.

No. 37. Dor, Avi, Luis Locay, Warren Sanderson, Paul Gertler, and Jacques van der Gaag. "Health Care Financing and the Demand for Medical Care." May 1987.

No. 31. Suarez-Berenguela, Ruben M. "Financing the Health Sector in Peru". April 1987.

No. 45. Gertler, Paul and Jacques van der Gaag. "Measuring the Willingness to Pay for Social Services in Developing Countries. May 1988.

Gertler, Paul and Jacques van der Gaag. "The Willingness to Pay for Medical Care, (book manuscript). October 1988. This has been given to the Publications Committee for review.**

LSMS No. 35 is forthcoming in the Journal of Health Economics.

LSMS No. 37 comprises two reports, one of which has been published in the Journal of Econometrics and other is forthcoming in the Journal of Health Economics.

2. DISSEMINATION - Seminars, Conferences, Training Sessions (topic, date, location, and participation).

Seminars were presented in the Bank to regional and economic staff and the papers were presented at professional conferences both in the US and in Europe.

*Indicate with asterisks the project's principal reports. Provide the Research Administrator's office with one copy of each of these reports. Additional copies may be requested if the project is later subject to evaluation by the Research Committee.

VI. OBJECTIVES AND RESULTS

In the following section, please briefly summarize the results of the project in relation to its objectives, using additional space as necessary. The narrative should be organized according to the points listed below.

1. What general questions did the study seek to answer? What answers did it find? How significant are these answers for a) development policy in general? b) Bank operations?

2. To what extent did the study fulfill its objectives? Did the objectives change as the study was undertaken? If yes, why?

This project examined the impact of user fees on the demand for health services in rural areas of two developing countries. The study looked for answers to such questions as: How would the use of health services be affected by new fee policies: Would users shift from some types of health care providers to others? Would some user groups fare better or worse than others? Would there be differences by type of health service: How much in additonal resources would be mobilized?

Some researchers have hypothesized that factors other than price, particularly perceived quality of care, dominate in household health care choices and that existing fees for public health services could be raised substantially without appreciably affecting use. To test this hypothesis it is necessary to know how price sensitive the demand for medical care is, and how this price sensitivity differs by socioeconomic group. A major part of the research has therefore been devoted to generating reliable estimates of price elasticities of demand, including the influence of non-price factors such as quality of services, costs other than fees (time and travel), health status and socioeocomic factors such as income and education.

The study used data from the Living Standards Measurement surveys conducted in Côte d'ivoire and Peru in 1985. (See RPO 673/22 and 673/26). A theoretical model was developed to explain the health care providers choice of individuals who suffered from an illness or injury. The estimation results were surprisingly similar, despite the fact that both economies have very different health care systems. Based on the estimation results, the consequences of alternative price and reinvestment policies were simulated in various settings to illustrate how rational decisions can be reached based on the trade-off between cost recovery and protecting the poor. The criteria for judging the feasibility and desirability of user fee policies were: The potential for raising revenues; changes in patterns of use of medical care; and the effects on welfare, especially for the poor.

Continued

Findings and Implications for Policy

- o The demand for medical care is price sensitive, but much more so for the poor than the rich.

The revenue potential of user fees is low in poor areas, high in wealthier areas. User fees approaching the marginal costs of care will effectively price the poor out of the market, but do not substantially deter residents of wealthier villages from using medical care. Both from the point of view of cost recovery and of equity, therefore, some sort of price discrimination is necessary. Since targeting the poor for price discounts may be administratively difficult, geographic discrimination (charging lower prices for facilities that primarily serve lower-income groups) may be an answer. Fees should be introduced gradually, guided by evaluation of resulting impacts on patterns of use of medical care.

- o Child care is more price elastic than adult care.

Imposing or raising user fees will harm children's health and welfare more than adult's. It would make good economic and humanitarian sense (as well as being logistically simple) to exempt child care from increases in the fee structure for medical care, or at least to differentiate between fees for child and adult health care.

- o Alternative health care providers are closer substitutes than self care.

Charging fees for higher levels of care (for instance hospitals) generally causes individuals to move to other types of care rather than to drop out of the medical care market. This result suggests that it would be worth experimenting with higher charges for higher levels of care, carefully monitoring the effect on demand for medical care overall and adjusting accordingly.

The general message to policy makers is thus one of gradation and differentiation. User fees could significantly increase resources needed to improve the health system. If they are introduced selectively, and special measures are being taken to protect the poor, the policy can at the same time improve the equity of the system. But if no special measures are taken, a user fee policy will perpetuate the inequitable distribution of health care in the developing world.

The findings call for a reevaluation of the Bank's current stand on user fees for social sector financing. It is currently being scheduled that in cooperation with the PHR divisions in the regions and the other divisions in the PHR Department, workshops will be organized to draw the implications of the results for project and programs in the social sector.

The project set out to be a case study of just Peru. Unfortunately the data scheduled to be used for this project were not available on time. Fortunately LSMS data sets for both Peru and Côte d'Ivoire turned out to be rich enough to answer the main questions of this project. As a consequence we obtained results from two very different countries which facilitates the generalization of the policy conclusions. In the end we did obtain the original data set that should have formed the basis for the project. We currently are in the process of analyzing these data in the hope that they confirm as well as supplement our main findings.

LSMS

Living Standards Measurement Study Working Paper No. 35

The Demand for Medical Care in Developing Countries: Quantity Rationing in Rural Côte d'Ivoire

Avi Dor
Jacques van der Gaag

LSMS WORKING PAPER SERIES

No. 1. Living Standards Surveys in Developing Countries.

No. 2. Poverty and Living Standards in Asia: An Overview of the Main Results and Lessons of Selected Household Surveys.

No. 3. Measuring Levels of Living in Latin America: An Overview of Main Problems.

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No. 6. Household Survey Experience in Africa.

No. 7. Measurement of Welfare: Theory and Practical Guidelines.

No. 8. Employment Data for the Measurement of Living Standards.

No. 9. Income and Expenditure Surveys in Developing Countries: Sample Design and Execution.

No. 10. Reflections on the LSMS Group Meeting.

No. 11. Three Essays on a Sri Lanka Household Survey.

No. 12. The ECIEL Study of Household Income and Consumption in Urban Latin America: An Analytical History.

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The Demand for Medical Care in Developing Countries: Quantity Rationing in Rural Côte d'Ivoire

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The LSMS working paper series may be obtained from the Living Standards Measurement Study, Development Research Department, The World Bank, 1818 H Street, N.W., Washington, D.C. 20433, U.S.A.

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LIVING STANDARDS MEASUREMENT STUDY

The Living Standards Measurement Study (LSMS) was established by the World Bank in 1980 to explore ways of improving the type and quality of household data collected by Third World statistical offices. Its goal is to foster increased use of household data as a basis for policy decision making. Specifically, the LSMS is working to develop new methods to monitor progress in raising levels of living, to identify the consequences for households of past and proposed government policies, and to improve communications between survey statisticians, analysts, and policy makers.

The LSMS Working Paper series was started to disseminate intermediate products from the LSMS. Publications in the series include critical surveys covering different aspects of the LSMS data collection program and reports on improved methodologies for using Living Standards Survey (LSS) data. More recent publications recommend specific survey, questionnaire and data processing designs, and demonstrate the breadth of policy analysis that can be carried out using LSS data.

ABSTRACT

Several authors have pointed out the implications of financing medical care from general public funds. Among these are Akin (1986), Birdsall (1986), Jimenez (1986) and de Ferranti (1985). The most authoritative treatment of this issue is given in "Financing Health Services in Developing Countries: An Agenda for Reform, (World Bank, 1987). A common theme in the discussion is that user fees can improve efficiency and the prospects for cost recovery, while maintainig current levels of equity. In order to evaluate this arguement, it is necessary to assess the responsiveness of consumers to changes in the price of medical care. Little evidence from developing countries exists to date.

In this paper we attempt to fill the gap by analyzing the demand for health care in the rural Cote d'Ivoire where user fees are zero, but private access costs may be substantial. Using a mixed discrete choice/continuous demand analytical framework, we show that the absence of user fees per se does not guarantee equal access to all consumers. Private costs, represented by travel time, result in non-price rationing similar to the conventional money price mechanism. Our results strongly suggest that if revenues obtained from user fees are used to improve the regional distribution of services, the resulting system may actually improve equity over the long-run.

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Introduction

Besides the social desirability of improving health, the health status of the population is relevant to the economic development of a country for two reasons: First, as an indicator of economic development, it shows the ability and success or failure of a country to provide for the most basic needs of the people (food, adequate sanitary conditions, shelter). The correlation between such crude indicators as child mortality and life expectancy on the one hand, and per capita income on the other, is very robust and has been extensively documented (e.g. Preston 1975, 1980; WDR, 1984).

Secondly, health - as a form of human capital - is an input for the further development of a country. There is ample evidence to suggest that health plays an important role in school enrollment and school performance of children (see for instance, Edwards and Grossman 1979, Bartel and Taubman 1979, Cooper and Rice 1976) and in labor supply and productivity of adults (Berkowitz et al. 1983, Grossman 1975, Grossman and Benham, 1974) and on earnings (Luft, 1976). Furthermore, high infant and child mortality rates are among the most important factors related to high fertility rates, which in turn play a crucial role in development.

Life expectancies as low as 38 years at birth may be found in the poorest among developing nations such as Guinea and Somalia. 1/ In middle income countries which include Côte d'Ivoire, life expectancies average 55 for males and 58 for females. In comparison most developed countries have attained life expectancies well above 70 years of age. Similar disparities exist in infant mortality rates. The highest infant mortality rate in the

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1/ 1982 figures.

world exists in Afghanistan where 205 of every 1,000 live born infants die during the first year of life. In the majority of developing countries exhibit infant mortality rates in excess of 90 infants per 1000, compared with average of 10 in the industrial market economies.

In light of the above it is not surprising that improving the population's health features as a major goal on the agendas of many local and national governments in less developed countries (LDCs). Although many other factors are relevant for achieving this goal (adequate food supplies, sanitation, education), providing medical care to those who need it plays a central role in improving health.

It is usually quickly recognized that a pure market approach to providing medical goods and services is unlikely to produce satisfactory results. The general arguments for some form of government intervention and regulation are well known. In some cases, health-care is a pure public good (air quality control, general anti-epidemic campaigns), in other cases large externalities exist (inoculations against contagious diseases). And where medical care can be identified as a private good, a market approach may lead to outcomes that are judged to be unacceptable on equity grounds. Add to this: Allegedly widespread consumer ignorance, the need for quality control, the scarcity of private funds for investments in human capital (medical education) and in non-human capital (hospitals), and a heavy government hand in the health-care sector can easily be explained. Indeed, in industrialized countries as well as in LDCs, the health care sector is without exception among the most extensively regulated industries.

In LDCs, government intervention in the health-care sector has often lead to a system that provides medical care free-of-charge or for a price that bears little resemblance to the marginal cost of the service or product. General revenues serve as the major source of financing. Revenues from user charges usually contribute less than 10 percent of recurrent expenditures (Ainsworth, 1983, de Ferranti, 1985).

Unfortunately, in their quest to provide medical care free-of-charge or at very low cost, governments have sacrificed the availability of care in order to maintain affordability. Public budgets have been proven to be insufficient for providing adequate care to the majority of the population. Though other factors have also played a role, it seems fair to say that the combination of highly subsidized care and insufficient general funds has lead to a general structure of the health care sector that has the following characteristics:

(i) Quantity rationing has taken the place of the price mechanism. Where financial resources are insufficient to finance a health-care system that meets the need of the population, effective demand is constrained by the sheer lack of medical facilities, personnel and drugs.

(ii) Available supply is unequally distributed, with a strong urban bias. In many LDCs, doctors, nurses and hospital beds are concentrated in the cities, in spite of the fact that the vast majority of the population lives in rural areas.

(iii) Modern curative care ("high-technology" hospitals, "western" doctors) has won the battle over scarce resources, leaving little to finance preventive activities and basic care. This is particularly damaging in LDCs where the leading causes of death are infectious and parasitic diseases. Many of these diseases can be prevented or treated adequately with relatively cheap and simple techniques.

(iv) With barely enough resources to cover salaries and the most basic drugs, there is no money left for equipment or for maintenance of the existing facilities. Consequently, available resources are used inefficiently (doctors without equipment) and the limited amount of medical care that is provided, is generally of low quality.

Growth projections for most of the developing world are not optimistic (WDR 1985, 1986) and many LDCs are coping with IMF-type austerity programs and World Bank-type structural adjustments that usually put severe constraints on the government budget.

In recent years, there has been a growing awareness of the need to find new sources of finance in order to expand social services in developing countries and in some cases avert their virtual collapse. Whereas funds for capital investments are often available through international donors the public sector must find new ways to finance operating and maintenance costs, i.e., recurrent costs. Much of the discussion focuses on the usefulness of user fees in the health care sector. (Birdsall 1983, de Ferranti 1985). In most developing countries there appears to be a political consensus in favor of free medical care. In Côte d'Ivoire this is manifested in a presidential commitment not to impose fees on medical services.

The discussion on how to finance medical care no longer questions the need to search for resources other than general public funds. Rather, the focus is on where and how to introduce so called "user fees", i.e. charges to those who actually use the medical services. 1/ The benefits of this option go well beyond revenue raising per se. First of all, if goods and services are priced adequately (i.e. are set equal to their marginal costs), society will allocate it's scarce resources efficiently. For instance, simple measures of preventive medical care are likely to get higher priority under a marginal cost-pricing scheme, because the cost of a unit of preventive care is well below that of a unit of curative care. Furthermore, when prices are zero, there is excess demand for certain goods and services, a situation that can be remedied by the introduction of user charges.

The strongest argument in favor of the current policy to provide medical care free-of-charge (or at very low cost), is that it promotes equal access by eliminating financial barriers. However, given the distorted regional distribution of facilities, the policy does not result in an equitable health care delivery system. In fact, the policy tends to be regressive with most beneficiaries living in the higher income urban areas.

Nevertheless, the introduction of user fees into a system that is currently providing goods and services free-of-charge raises many questions regarding both the efficiency and the equity of the system. Among them:

1/ For a discussion of other options (.e.g. many variants of risk sharing) see de Ferranti 1985.

(i) For which goods and services are fees desirable? Should the fee be equal to the marginal cost of the product? Can the marginal cost be measured? Should the fee be high enough to recover all cost, or should certain services be subsidized?

(ii) Though money prices are currently zero, the private cost of obtaining medical care can still be substantial. Travel time is often very long and the monetary cost of traveling can be a substantial outlay for poor families. How can user fees be introduced without making the total cost of obtaining medical care prohibitively high?

(iii) Many studies show high income elasticities for medical care. Will poor families be able to pay the price, if money fees are to be set high enough to recover a substantial part of the total cost?

In this paper we will make a start with answering some of these questions. Our focus will be on current health care utilization patterns in rural Côte d'Ivoire. We will investigate the extent of <u>quantity rationing</u> for medical services provided by doctors and nurses, by estimating own and cross time-price elasticities for these services. We will also look at the corresponding income elasticities.

In the next section we will present background information on the health-care system in Côte d'Ivoire. In Section 3 we present the anayltical framework used, as well as descriptive statistics on health status and health care utilization. The data stem from the Ivorian Living Standards Survey. In Section 4 we present the estimation results for adults, infants and children. Section 5 summarizes the main results and draws policy conclusions.

II Background Information on Côte d'Ivoire

2.1 The Health Care System

In order to provide a general background for the analysis presented in the subsequent sections, we now present some general information on the economy and the health care system in Côte d'Ivoire. Since independence (1960), The Côte d'Ivoire has seen a steady economic growth, from a level of \$145 per capita in 1960 up to \$1,207 in 1980, 1/ the high point of its economic development. During this period crude health indicators improved significantly. The infant mortality rate decreased from 167 in 1960 to 119 in 1982, while life expectancy at birth increased from 39 to 47 years (Table 2.1). Still, these indicators are little better than those prevailing in neighboring West African countries which are much poorer, and they compare unfavorably to those of an "average" lower middle income country.

Large differences of health exist within the country. In Abidjan life expectancy was estimated at 56 years in 1979, compared with only 39 years in the rural Savanna regions , and 50 years in the urban Savanna regions. Child mortality rates in rural areas exceed those in Abidjan were twice as high as child mortality prevailing in rural areas.

Part of these differences are likely to be related to the unequal distribution of welfare in The Ivory Coast. Based on the value of total household consumption 2/ only 3.3 percent of those in the lowest quintile live

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1/ All dollar equivalents are in current values for the relevant years.

2/ Total Household consumption is measured as the sum of cash expenditures on consumption goods, plus the value of home grown produce consumed by the household.

in Abidjan, while 45.7 percent of "the poor" live in the Savanna area (Table 2.2). Just 3.9 percent of "the rich" live in the Savanna, while 42.8 percent of them live in Abidjan. 1/ This large, urban-rural welfare gap is paralleled by the distribution of health care facilities.

TABLE 2.1: Health Indicators for Côte d'Ivoire and Lower Middle Income Countries (averages)

	Côte d'Ivoire		Lower Middle Income	
	1960	1980	1960	1980
Crude Death Rate	24	17	20	12
Infant Mortality Rate	167	119	114	89
Child Mortality Rate	40	23	28	13
Life Expectancy at Birth	39	47	45	56

SOURCE: The Côte d'Ivoire Country Economic Memorandum, the World Bank, 1986.

TABLE 2.2: The Regional Distribution of Welfare in Côte d'Ivoire Consumption Quintiles, Percentages.

		QUINTILES				
	Total	1	2	3	4	5
Abidjan	18.8	3.3	5.2	13.2	29.2	42.8
Other Cities	22.4	7.0	18.1	28.2	27.1	31.8
Rural East	24.7	35.2	35.4	22.5	19.9	10.6
Rural West	15.2	8.8	19.6	21.9	14.9	11.0
Rural Savanna	18.9	45.7	21.8	14.1	9.0	3.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

SOURCE: Glewwe (1987)

1/ For a more extensive assessment of the distribution of welfare in the Côte d'Ivoire see Glewwe (1987).

About 40 percent of the population in Côte d'Ivoire lives in urban areas. Abidjan alone accounts for a population of 1.6 million, or about 17 percent of the total of 9.3 million (1983). All major hospital facilities are in the cities. The two university hospitals (about 1300 beds in total) are situated in Abidjan, while the five regional hospitals (general hospitals with a capacity of about 275 beds) are found in the cities of Bouaké, Man, Daloa, Abengourou and Korogho. Together these hospital facilities account for 41 percent of all beds. Rural areas are served by small local hospitals, maternity and child care units, dispensaries and mobile health units.

The hospital sector employs 70 percent of all doctors, 45 percent of all midwives and over 50 percent of all nurses. About 60 percent of all doctors are based in Abidjan. The overall health manpower situation is unbalanced. In 1983 there were about 600 doctors, 2200 nurses and 1000 midwives, but virtually no skilled auxiliary Workers. 1/ Given the current health manpower training system, the World Bank projects that the number of western doctors will increase from 6.5 per 100,000 population in 1983 to 7.8 in 2000. The number of nurses per capita will increase from about 24.9 to 26.5. Thus, the already low nurse/doctor ratio of 3.8 will further decrease to about 3.4.

All health workers are paid by the government. Medical care is, in principle, provided free of charge. For 1984 the government health budget was

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1/ There is also an unknown number of traditional healers. Furthermore there are about 7000 "journaliers" working in the health care sector, ranging from gardeners and chauffeurs to laboratory assistants and X-ray machine operators. Most of them are unskilled or received informal training only.

32.6 billion CFAF, or 6.8% of the total budget. [1/] More than 75 per cent of this budget is for personnel cost, about 8 percent for drugs and the rest for materials, equipment, maintenance and other operating cost. Current manpower projections indicate that the total health budget will soon be insufficient even to cover personnel cost only, unless the budget grows much faster than other parts of the government budget, or unless other financial resources are found.

The general quality of the existing facilities leaves much to be desired. A 1979 study showed that of the 309 dispensaries, one third was more than 20 years old, only 19 percent had piped in water and just 21 percent had a working water pump. Pharmaceuticals are in short supply and two thirds of the dispensaries, which are supposed to serve as referral centers, lack any means of transportation. Of the 126 Maternal-Child Health Care units (MCH), 45 percent had no water and 31 percent no electricity. Only 20 percent are able to provide preventive services and general health education, though these tasks are supposed to be part of the workload of all MCHs. The two university hospitals in Abidjan have occupancy rates well in excess of 100 percent, but most of the hospitalized patients are just waiting for the arrival of necessary drugs and other supplies and/or for the repair of equipment. In one university hospital two of the six ORs have not been used during the past three years because basic equipment is broken and funds are lacking for replacement.

In light of the above, it is not surprising that there is increasing pressure to search for alternative ways to cover the recurrent costs of the

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1/ Recurrent budget only.

Ivorian health care system. The subsequent analysis aims at providing results that will help to make informed decisions regarding this issue.

2.2 Health Status as Reflected by The Ivorian Living Standards Survey

The ILSS which is discussed in detail in Section 3.2 enables us to go beyond the generally available mortality and life expectancy data. It contains information about morbidity, such as the incidence and severity of illness in the population, which is given below by age, sex and geographic location. The weakness of these data is that they are based upon subjective assessments of own states of health.

In terms of self reported health status, about 30 percent of the individuals interviewed by the ILSS reported to have suffered from an illness

TABLE 2.3: Percentage of Individuals who Report an Illness or Injury during the past four Weeks; by Location, Age and Sex

	Abidjan			Other Cities			Villages			Ivory Coast		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	30.73	35.22	33.19	30.26	29.93	30.10	32.08	30.05	31.15	31.48	30.98	31.26
6-15	21.99	20.05	20.98	23.03	20.60	21.84	20.63	19.89	20.28	21.43	20.98	20.27
16-35	26.41	32.93	29.86	27.06	31.57	29.70	23.97	26.81	25.61	25.58	29.40	27.69
36-49	40.80	40.32	40.56	44.80	44.59	44.69	46.08	42.27	43.70	44.60	42.40	43.32
50+	32.05	42.00	35.94	57.52	51.22	54.24	54.80	55.73	55.26	52.77	53.09	53.32
Total	27.81	30.79	29.36	30.37	30.77	30.57	30.99	31.21	31.11	30.26	31.03	30.67

or injury during the four weeks prior to the survey (Table 2.3) 1/. No major sex differentials exist, but there is a distinct age profile. Young children (0-5) show an incidence of illness and injury equal to the overall average, while older children (6-15) show the lowest incidence rate. Adults (16 and over) show a monotonous increase of illness with age.

Table 2.4 reflects the anticipated decline in health associated with age: mean restricted activity days increase with age. The mean restricted activity days in rural areas is 7.7 for males and 8.7 for females compared with little over five days in urban areas. Thus, while the incidence of self-reported health problems appears to be higher in the cities, health problems are on average more severe in rural areas.

TABLE 2.4: Mean Number of Restricted Activity Days During the Past Four Weeks; by Location, Age and Sex

	Abidjan			Other Cities			Villages			Ivory Coast		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	5.57	4.46	4.93	4.73	5.38	5.04	6.11	6.31	6.21	5.74	5.74	5.74
6-15	3.90	4.03	3.97	3.82	3.57	3.71	5.08	4.83	4.96	4.56	4.36	4.46
16-35	3.60	5.52	4.72	3.68	5.63	4.78	7.53	7.32	7.40	5.37	6.40	5.98
36-49	3.88	8.48	6.11	4.47	7.06	5.87	7.50	7.45	6.47	6.07	7.51	6.90
50+	8.36	10.29	9.24	10.17	7.73	8.97	10.97	12.47	11.71	10.66	11.53	11.09
Total	4.45	5.63	5.09	4.95	5.64	5.31	7.52	7.88	7.71	6.40	6.96	6.69

1/ For the sake of completeness, we present data on individuals who live in Abidjan, Other Cities, and the Villages. Most of our discussion, however, will focus on rural areas, i.e. the Villages.

Table 2.5 shows the distribution of visits to formal health workers i.e. doctors nurses and midwives. Since obstetric care is included in the table it is no surprise that prime age females usually obtain more medical care than prime age males. In the oldest cohort, where obstetric care is no longer relevant the reverse occurs: elderly females obtain less formal care than elderly males, with the exception of Abidjan. Although the elderly are less healthy than younger adults, they tend to consume less medical care, particularly in rural areas.

TABLE 2.5: Percentage of Individuals with an Illness or Injury Who Obtained Medical Care (From Doctors, Nurses or Midwives)

	Abidjan			Other Cities			Villages			Ivory Coast		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	68.25	68.97	68.67	69.57	60.25	65.00	46.26	41.91	44.36	54.36	51.44	52.99
6-15	50.68	61.64	56.16	50.45	52.08	51.21	41.94	40.85	41.43	45.60	47.64	46.56
16-35	53.95	62.20	58.72	53.85	57.49	55.89	39.59	47.33	44.27	47.52	53.88	51.26
36-49	60.78	68.00	64.36	62.50	59.09	60.66	45.39	38.89	41.46	52.42	47.29	49.48
50+	60.00	47.62	54.35	52.31	46.03	49.22	32.30	31.21	31.76	37.53	34.70	36.14
Total	57.45	63.54	60.77	57.05	55.63	56.32	40.59	40.10	40.33	47.30	47.95	47.64

This straight forward presentation of the data clearly illustrates the severity of health problems in The Ivory Coast. Roughly one-third of the population is ill during any given 4-week recall period, and on average, those who are ill loose about one-quarter of their time due to the illness.

III. Analytical Framework and Data

3.1 Analytical Framework

Only a handful of studies of household demand for health care exist to date. The majority of studies has focused on the discrete choice problem of choosing among alternative providers. These include Gertler et al. (1986), Mwabu (1986), Birdsall and Chuhan (1986), Akin et al. (1985 and 1986) and Heller (1982). A conventional analysis of the amount of care demanded, measured by medical expenditures or number of consultations is found in Musgrove (1981) and Heller (1982). Musgrove found that income effects in Latin America are substantially higher than income effects in developed countries. 1/ In general, the literature has not been able to show that money prices affect utilization. However, Gertler et al. using a model in which price effects depend on income show that health care demand is highly elastic with respect to prices for low income groups, but that the price effect diminishes as income increases.

1/ Income elasticities in the various Latin American countries tended to concentrate around unity. Income elasticities not exceeding 0.3 are commonly found in the developed countries. This is shown to be the case for the number of health care visits by individuals (van de Ven and Van der Gaag, 1982, Acton, 1975), by the household (Holtman and Olsen, 1978) and for aggregates of the population (Benham and Benham, 1975). Similar results were obtained for health care expenditures by individuals (Phelps, 1975). Income elasticities of demand for pediatric care tend to be considerably higher, as shown by Colle and Grossman (1978).

As we mentioned earlier, travel time is expected to be a particular powerful rationing devise in poor countries, where the majority of the population inhabit rural areas and health infrastructures are concentrated in the cities. Furthermore, Acton (1975, 1976) has shown that when money prices are low, time becomes the dominant rationing mechanism. Past studies in developing countries have not been able to confirm this, primarily due to data limitations. The main purpose of this paper is to identify the impact of travel time and other economic variables on health care utilization in rural Côte d'Ivoire, where medical services are rendered free of charge.

In order to address this issue we define a general health care demand function.:

$$M = M(P, Y, H, Z)$$

with M the demand for medical care

P a vector of prices, including time prices

Y a measure of income

Z a vector of socioeconomic variables

H a measure of health capital

Throughout this paper we will first look at the determinants of market entry, i.e. we analyze the question of who obtains medical care in case of an illness or injury. M, the demand for medical care, is thus defined as a zero-one dummy variable. We adapted the standard logit model for this part of the analyses. Secondly, we estimate a provider choice model that gives the probabilities of seeking care from a doctor or a nurse, relative to not seeking care at all. [1] We use the multinomial logit model for this step of the analyses. Finally, we analyze the number of consultations with each provider using a two step estimation procedure that corrects for the selectivity bias that stems from the fact that a positive number of consultations is only observed from those who have chosen a particular provider. [2]

3.2 Data and Summary Statistics

A. The Ivorian Living Standards Survey

The data used in this study are drawn from the Ivorian Living Standard Survey (ILSS). This multi-purpose household survey, which aims at measuring many socioeconomic factors relevant to the living standards of Ivorian households, was started in February 1985. [3] During the first 12 month period, 1588 households will be interviewed, of which 950 were located in rural areas. Approximately 93 percent of these households are farming households. Detailed information on health-care utilization is obtained from all household members who reported an illness or injury during the four weeks prior to the interview. The ILSS also contains extensive information on many socioeconomic aspects relevant to the demand for medical care.

1/ The alternative of seeking care from a traditional healer is ignored (see Appendix A).

2/ For a more explicit description of the econometric specification see Appendix B.

3/ For detailed information on this survey, see Grootaert, 1985.

The ILSS also contains extensive information on many socioeconomic aspects relevant to the demand for medical care. In this study we use total household consumption ("income") as a measure of the household's economic well-being. Variables such as age, sex and years of schooling are also included as exogenous variables.

Health status is indicated by an individual's own assessment of whether or not he suffered from an illness or injury during a 28-day recall period. Recall that Table 2.3 shows the percentage of the population that report an illness during this period. Of the 30 percent reporting an illness, about 57 percent obtained some form of formal or traditional health care. Figure 1 depicts the distribution of care by type of practitioner. While more than half of those who obtained medical care in Abidjan consulted a doctor, in the villages only 17 percent saw a doctor. Still fewer rural dwellers consulted a traditional healer (11 percent), while the majority of rural dwellers consult a nurse (58 percent). Information on medical consumption includes the number of visits to each type of provider, expenditures on consultations (if any) and expenditures on drugs.

In addition to household data, the ILSS collects community level information in rural areas. The rural component of the household survey was comprised of 56 sample clusters, which roughly correspond to small villages. However, the community survey was completed in only 52 rural clusters. Relevant to the current study is the data on the availability of various types of health care facilities. Travel time is reported for the nearest available facility of each type (hospital, clinic, maternity center, etc.). When a provider is available in the village, travel time is recorded as zero.

HEALTH PRACTITIONER CONSULTED BY RESIDENCE

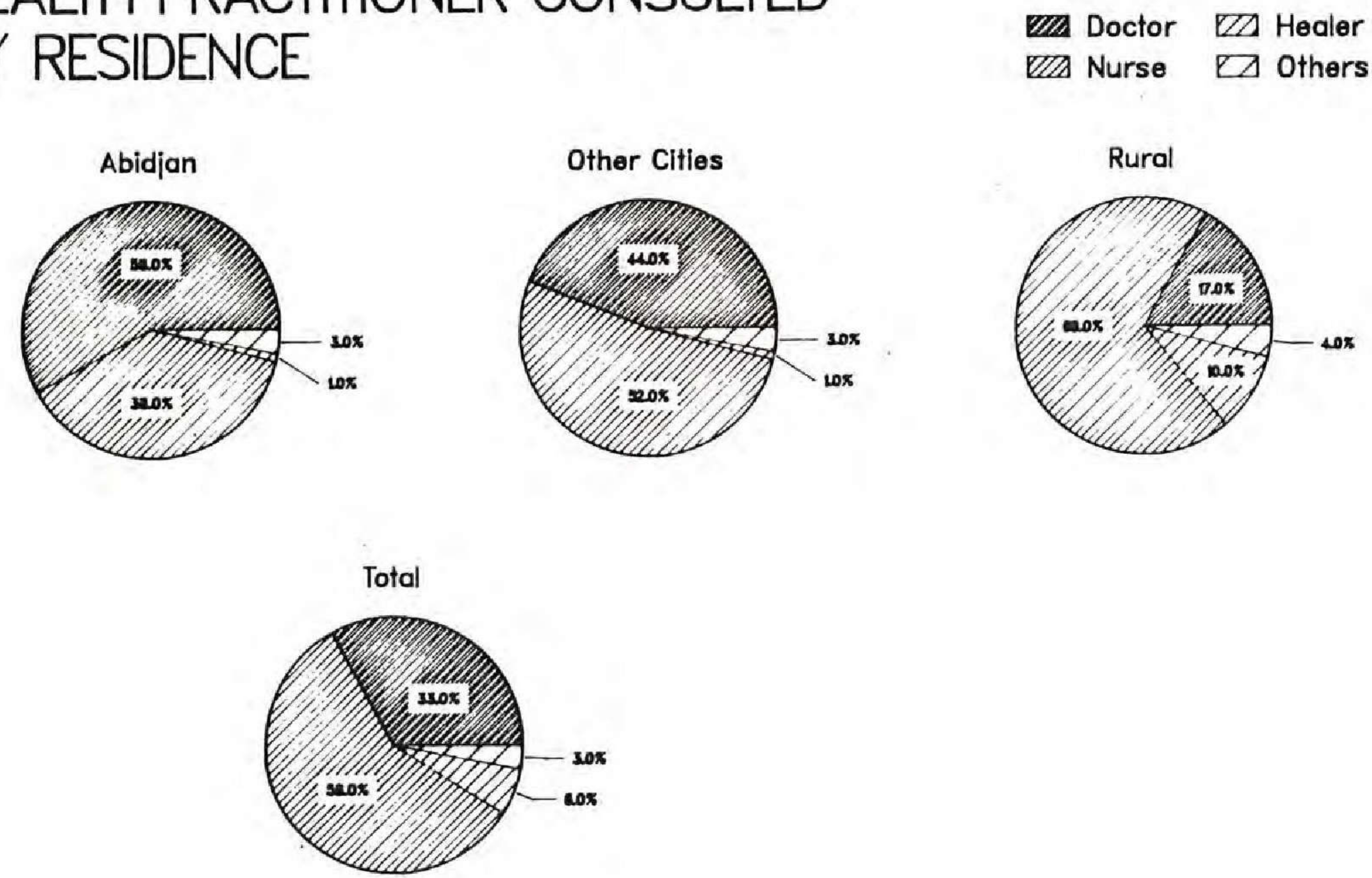

Figure 1

B. The Rural Sample and Variables

The rest of this study deals strictly with the rural segment of the population. Summary statistics for adults (everyone over 16 years of age) are shown in Table 3.1; summary statistics for infants (under 6) and toddler (6-15) are shown in Table 3.2. In three out of the 52 clusters (villages) travel time to sources of health care was not known. Since the analysis presented here draws heavily on travel time information these clusters were deleted from the sample. Of the remaining 49 clusters, only 12 had a nurse, and none had a medical doctor.

All of the individuals in the sample belong to one of 665 households interviewed in these clusters. The overwhelming majority of households, i.e. 637, was headed by males. The mean age of heads of households is 48.87 (s.d. = 13.96) and their mean years of schooling is only 1.05 (s.d. = 2.50).

Demographic variables such as age, education, sex, and the composition of the household (number of adults and number of children) enter the model in a simple linear fashion. Non-linearities in age were accounted for by dividing the sample into age groups. The education variables are years of schooling in the adult sample and years of father's schooling in the younger age groups. Educational attainment is typically low and there is little variation in schooling. Approximately 83 percent of the adults had no education, with the remainder ranging from 1 to 12 years of schooling. In the combined child sample, about 87 percent had fathers with no education, while less than 2 percent had fathers with more than 10 years of schooling. Since there is even less variation in mother's schooling, this variable was not included in the estimation. Whether a person chooses a doctor or a nurse should also depend on certain preconceptions or cultural biases of the decision-maker. Such prejudices will not effect the amount of health care obtained once a provider has been selected. Cultural biases in favor of one type of health provider and against another may be expressed as a function of a person's nationality, ethnic group, religion or tribal affiliation. Our sample was almost strictly Ivorian, and unfortunately the remaining variables were not available (future LSMS surveys will incorporate such variables). We opted for a regional dummy variable (Savanna) as a proxy for cultural differences. This variable only enters the discrete choice models.

An individual's health status is measured by the number of days during the past four weeks that an individual was not restricted in his normal activities. For adults and older children this is obtained by subtracting the number of days someone was restricted by an illness or injury from the 28 day recall period. In the case of infants, for whom this information is not available, we use 28 minus reported sick days. This variable is expected to reduce the probability of seeking medical care.

It is important to note that elderly persons typically have more sick time than prime age adults; they can expect a certain number of restricted activity days to be their normal state. This implies that an elderly person would require a relatively large number of restricted activity days in order to motivate an initial visit to a health practitioner. Thus, the anticipated positive effect of restricted activity days on the probability of seeking medical care should decrease with age. Conversely, the positive effect of unrestricted days on the probability of seeking medical care is likely to increase with age (i.e. become less negative). For this reason we include an interaction term between our health measure and age, in the adult discrete choice models. In the case of children, we will assume that the valuation of the child's health will depend on the assessment by the parents rather than on the child's own assessment. Therefore we included an interaction of health and the father's education in the "child" discrete choice model.

Once a person selects a health care provider, healthiness is likely to affect the number of medical consultations in opposite directions. On the one hand, the healthier the person the fewer the number of consultations needed. On the other hand relatively healthier patients are better equipped to undertake trips to their preferred provider. In order to see which of the two effect prevails, the unrestricted days variable enters the quantity demand regressions in a quadratic fashion.

TABLE 3.1: Summary Statistics
Rural Adults with Illness or Injury

SAMPLE	Ages 16 - 49		Age 50 +	
Number of persons with positive sick time	702		492	
VARIABLES	Mean	Standard Deviation	Mean	Standard Deviation
Endogenous				
Probability of obtaining formal medical Care	.43	.50	.32	.47
Probability of seeing a doctor	.10	.31	.08	.27
Probability of seeing a nurse	.32	.48	.25	.43
number of doctor consultations	31	1.46	.31	1.88
number of nurse consultations	.92	1.98	.95	2.34
Exongenous				
Travel time to doctor (in hours)	.86	.70	.92	.95
Travel time to nurse (in hours)	.56	.62	.56	.63
Income; annual household consumption (in millions of CFAF)	1.32	1.21	1.09	.96
Years of age	32.82	10.00	61.56	9.78
Sex (male = 1, female = 0)	.37	.48	.51	.50
Years of education	1.46	2.82	.12	.72
Number of adults in the household (age 16+)	5.61	4.93	5.17	3.84
Number of children in the household (age < 16)	5.66	5.71	4.36	4.39
Number of unrestricted activity days (maximum = 28)	20.60	8.56	16.06	11.05
Savanna resident (= 1 answer is yes, = 0 otherwise)	0.29	0.45	0.32	0.46

TABLE 3.2: Summary Statistics
Rural Children with Illness or Injury

SAMPLE	Ages 0 - 5		Age 6 - 15	
Number of persons with positive sick time	429		380	
VARIABLES	Mean	Standard Deviation	Mean	Standard Deviation
Endogenous				
Probability of obtaining formal medical Care	.46	.50	.43	.50
Probability of seeing a doctor	.08	.27	.07	.24
Probability of seeing a nurse	.38	.49	.36	.48
number of doctor consultations	.19	.95	.17	.79
number of nurse consultations	1.02	1.89	.96	1.81
Exogenous				
Travel time to doctor (in hours)	.74	.64	.79	.81
Travel time to nurse (in hours)	.46	.58	.43	.57
Income; annual household consumption (in millions of CFAF)	1.40	1.26	1.41	1.20
Years of age	2.41	1.60	9.52	2.70
Sex (male = 1, female = 0			.52	.50
Years of education of father	1.05	3.12	.79	2.55
Number of adults in the household (age 16+)	5.57	4.96	5.19	4.34
Number of children in the household (age < 16)	6.67	5.50	6.73	5.52
Number of unrestricted activity days (maximum = 28)	21.92	7.52	22.88	6.80
Savanna resident (= 1 if answer is yes = 0 otherwise)	0.21	0.41	0.23	0.42

IV. Estimation of Demand for Health Care

4.1 Estimation Results for Adults

A. Entry to the Health Care Market

In order to quantify the effect of the exogenous variables on the probability of seeking medical care, we estimated a market-entry equation in Logit form for all persons with positive sick time (the dependent dummy variable equals one if the person consulted a medical practitioner). In Table 4.1 we present the estimation results for prime age adults (i.e. for persons between the ages of 16 and 49), for elderly persons, age 50 or above, and finally for the pooled adult sample. The coefficients(the β's) are reported with asymptotic t-values. Throughout this paper, the marginal effects are also reported for all dichotomous regressions. A formal derivation of the slope term is given in Appendix A.

In all the regressions in Table 4.1, the age variable has the expected negative effect and it is statistically significant in the elderly and pooled samples. We also ran the pooled regression with quadratic and splined age terms but this did not improve the results. 1/

1/ Age splines turned out to be significant in some of the child care regressions. All of the pooled models for children under the age of 16 presented here include an age spline.

TABLE 4.1: Determinants of Decision to Seek Medical Care in Case of Illness (Logit)

	Prime Age Adults (Age 16 - 49)			Elderly (Ages 50 +)			All Adults		
	β	T	Marginal effect	β	T	Marginal effect	β	T	Marginal effect
Constant	2.76	(3.36)	0.676	3.69	(2.99)	0.792	2.59	(5.50)	0.610
Average travel time	0.38	(2.37)	-0.090	-0.36	(2.06)	-0.076	-0.36	(3.03)	-0.081
Income	0.24	(2.86)	0.059	0.13	(0.93)	0.027	0.20	(2.69)	0.048
Age	-0.05	(2.60)	-0.013	-0.07	(3.61)	-0.015	-0.05	(5.79)	-0.011
Male	0.00	(0.02)	0.001	0.15	(0.73)	0.032	0.04	(0.29)	0.011
Education	-0.01	(0.30)	-0.003	-0.03	(0.18)	-0.006	-0.02	(0.61)	0.009
Adults	-0.08	(2.04)	-0.020	-0.01	(0.19)	-0.002	-0.06	(2.30)	-0.014
Children	0.03	(1.46)	0.008	0.07	(1.79)	0.016	0.04	(2.01)	0.010
Unrestricted days	-0.15	(3.33)	-0.035	-0.20	(2.03)	-0.043	-0.11	(5.36)	-0.026
Unrestricted days x Age	0.002	(1.97)	0.0005	0.003	(2.79)	0.001	0.002	(4.00)	0.0004
Savanna	-0.15	(0.72)	0.036	0.42	(1.65)	-0.090	-0.25	(1.60)	-0.058
Log likelihood		-444.65			-286.64			-737.76	
χ^2		70.16			48.81			119.04	
Income elasticity		0.183			0.095			0.156	
Travel time elasticity		-0.149			-0.181			-0.154	

The measure of healthiness, i.e. the number of unrestricted activity days has a significantly negative impact on utilization overall. Just as anticipated, this effect is dampened somewhat at old age. The positive sign of the healthiness and age interaction reveals that ceteris paribus, an older person requires relatively fewer healthy days (i.e. more sick days) in order to have the same probability of seeking health care as a younger person.

Since home care which is normally provided by adults, is viewed as a substitute for formal medical care, the number of adults in the household is expected to reduce the probability of seeking formal care. Since adults in the extended households must also devote a certain portion of their time to child care, the number of children in the household is likely to increase the probability of seeking care. Estimation results confirm our expectations. The household size variables always have the anticipated sign and are usually significant.

The remaining demographic variables appear to be less important determinants of market entry. Living in Savanna areas has a negative impact on market entry in all age categories, but is significant at a 10% level only in the elderly category. Sex and education do not have any effect on the decision to seek health care.

With the exception of health status, economic variables are the most important determinants of health care utilization. Individuals living in households with a relatively high income, show ceteris paribus a significantly larger probability of seeking care than their poorer counterparts. The income elasticity of the pooled sample, for instance, is 0.17 (at the sample means) comparable to the results usually obtained for industrialized countries, but well below the unit income elasticities obtained by Musgrove (1984). 1/

The travel time variable was obtained by averaging travel time to the nearest doctor and travel time to the nearest nurse. Perhaps the most important result is found with respect to this variable. The estimation

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1/ Note that Musgrove's estimates refer to health care expenditures while the current analyses deals with the probability of seeking care.

result implies a time-price elasticity ranging from -0.24 to -0.34 1/ at the sample means. Thus we were able to confirm the proposition that in the absence of money prices, other private costs of obtaining medical care play the role of the conventional price mechanism.

It should be stated here that, even though actual fees for medical care are zero, total out-of-pocket expenditures are likely to be positive due to transportation costs. Unfortunately, information on the money cost of travel that is associated with the consumption of medical care was not available in the survey.

The goodness of fit criterion χ^2, which is given in Table 5.1, is based on the general log likelihood ratio of the form

$$LR = L^*(\hat{\beta})/L^*(0).$$

$L^*(\hat{\beta})$ is the value of the maximized log likelihood using the estimated parameters and $L^*(0)$ is the maximized log likelihood function under the null hypothesis that all β's are equal to zero. It can be shown that $-2 \cdot \ln(LR)$ is approximately distributed as a χ^2_k (chi-squared), where k degrees of freedom are equal to the number of zero restrictions (Wilks, 1962). Throughout this study, χ^2 statistics are sufficiently large to reject the null hypothesis that the estimated β's are equal to zero.

1/ Comparable estimation procedures are found in Coffey (1983). The time-price elasticity reported there, of entry into the medical care system for low income females in Texas is virtually identical to the above results.

Finally we tested the validity of pooling across age groups. To do this we used another approximation to the χ^2 test, also known as the Wald test.

$$\chi^2 = [\beta_1 - \beta_2]\ [V_1 + V_2]^{-1}\ [\beta_1 - \beta_2]'$$

Where β_1 is the parameter vector belonging to prime age adults, β_2 is the parameter vector from the elderly regression and V_1, V_2 are the respective variance matrices. The result was 15.4, well below the 95 percent critical level of 19.7. Consequently we cannot reject the null hypothesis that $\beta_1 = \beta_2$, hence pooling is appropriate.

Before showing how the above results hold up when other models of demand for health care are estimated, concerns about selectivity bias should be mentioned. Although data was available for all persons who completed the interview, the estimating sample excludes all healthy people. To see whether this severely biases the sampled data, the Probit demand equation was estimated conditional upon the probability of being ill or injured. The procedure (due to van der Ven and van der Praag, 1981) yielded small changes in the coefficients and virtually no change in the slopes. Therefore it was concluded that no severe selection bias arose due to the exclusion of health persons.

B. Provider Choice, a Multinomial Logit Model

In the previous section we analyzed the decision to seek medical care in case of an illness or injury: when ill, an individual either obtained some form of medical care or obtained no care at all. In table 3.3 of the previous section we saw that for all rural adults who obtained medical care, the average number of visits to a doctor is .34 and to a nurse 1.14. In this section we first analyze this choice of health-care provider: to visit a doctor or a nurse, relative to not obtaining medical care at all. Then we will turn our attention to the number of consultations with each of these providers.

We specify a multinomial logit model of the following form:

$$\ln (P_j/P_o) = \sum_{k=1}^{2} \beta_{jk} T_{jk} + \gamma_j Z$$

with

P_j	The probability of choosing provider j
$j = 1$	Doctor
$j = 2$	Nurse, and
T_{jk}	Travel time to a given provider
Z	Composite of socioeconomic variables
β_{jk}, γ_j	The corresponding coefficients for choice j

P_o is the default option, i.e. it is the probability of not seeking care when ill, with coefficients normalized to zero. Thus, $\ln(P_j/P_o)$ is the logarithm of the probability of consulting provider j, relative to the probability of not seeking care at all. The composite Z contains the same exogenous variables as in the previous section. The T_k variables denotes travel time, and may be interpreted as choice-related price variables. Note that travel time for the "don't go" option is equal to zero.

It is easy to see that the log-odds ratio of any two alternatives depends on all choice related variables and on traits of the decision maker which are common to all choices. Thus the multinomial logit does not exhibit the Independence from Irrelevant Alternatives (IIA) property (see McFadden, 1981).

The interdependence of all alternatives is reflected in the elasticity of P_j with respect to X_k, where X_k represents any of the exogenous variables.

$$E_{jk} = (\beta_{jk} - \sum_{j=1}^{2} P_{jk}\, \beta_{jk})\, X_k$$

From the above, one may calculate own time-elasticities ($j = k$), cross time elasticities ($j \neq k$), or elasticities with respect to a trait of a decision-maker (replace β by γ). A derivation of various elasticities is given in Appendix B.

Estimation results are given in Table 4.2A. Time prices are represented by the time needed to travel to the nearest doctor and travel time to the nearest nurse. All own time-price effects have the expected negative sign. In the doctor alternative the coefficient is -1.95 with a t-value of 4.03. In the nurse alternative there is a highly significant negative own time-price effect of -0.20. In both alternatives cross time effects are positive and significant at the 0.99 significance level. These results suggest that in Côte d'Ivoire the services of nurses and doctors are substitutes, rather than complements.

The income effect in both alternatives is positive and significant. Income and travel time elasticities are given in Table 4.2B.

The Multinomial Logit Model strongly confirms and augments the results obtained from the simpler bivariate model: own time-price effects are negative, cross time-price effects are generally positive. The magnitude of these effects is substantially greater than those found by Akin et al. in the Philippines (1981, 1986).

We finally note that the impact of socioeconomic variables are generally stable across the entry-to-the-market and provider choice models. In particular, the coefficient of age is negative and highly significant. The sex effect (of being a male) is negative an insignificant in the nurse alternative, but positive and significant in the case of doctor visits. This indicates that males are more likely to obtain higher quality health care. These results are not compatible with the notion drawn from the standard utility model framework such as Acton's, that individuals with higher opportunity costs of time (e.g. working-age adult males) demand less medical care. Furthermore, negative age effects were not predicted by either variant of the Grossman (1972) household production model. The results of this study suggest that individuals who are relatively more productive obtain the largest share of medical care in the household.

An implicit assumption in the above model is that the probability choice set of an individual includes all prices and is therefore analogous to the conventional demand function. This type of probability choice set is found in Small and Rosen (1981). It differs from the Random Utility Maximization (RUM) framework described in McFadden (1981).

TABLE 4.2A: Multinomial Logit Model of Provider Choice Determinants of Choice between Doctor, Nurse, and Home Care Adults in Rural Areas with an Illness or Injury

	Nurse Alternative		Doctor Alternative	
	β	t	β	t
Constant	2.125	(4.23)	2.135	(3.39)
Doctor travel time	0.325	(3.38)	-1.953	(4.03)
Nurse travel time	-0.887	(5.57)	1.028	(2.31)
Income	0.234	(2.84)	0.259	(2.86)
Age	-0.048	(5.46)	-0.050	(4.54)
Male	-0.043	(0.29)	0.439	(1.95)
Education	-0.042	(1.54)	0.010	(0.21)
Adults	-0.054	(1.99)	-0.080	(1.99)
Children	0.039	(1.73)	0.053	(1.49)
Unrestricted days	-0.106	(4.81)	-0.130	(4.46)
Unrestricted days x Age	0.002	(3.86)	0.001	(2.52)
Savanna	0.093	(0.53)	0.407	(1.31)
Log likelihood	-967.49			
χ^2	198.66			

TABLE 4.2B: Income and Travel Time Elasticities of the Probability of Choosing a Doctor or Nurse

	Nurse Alternative	Doctor Alternative
Income elasticity	0.183	0.214
Travel time elasticities		
Nurse	-0.385	1.082
Doctor	0.310	-1.075

The current multinomial model can be made to conform with RUM by imposing zero restrictions on cross price effects. 1/

$$\ln(P_j/P_o) = \beta_j T_j + \gamma_j Z$$

The log odds ratio will not exhibit IIA in any strict sense, since it will always depend on Z, the person trait(s) common to all alternatives. 2/ As in the unrestricted case income elasticities of each alternative incorporates income effects of all other alternatives.

On the other hand alternatives are independent with respect to time prices. The own-time elasticity becomes:

$$E_j^{P_j} = \beta_j T_j (1 - P_j)$$

As in the case of binary logit, the cross elasticity of the probability of alternative j with respect to travel time to alternative m is:

$$E_m^{P_j} = - \beta_m T_m P_m$$

1/ Note that this is computationally identical to a conditional-logit model where socioeconomic variables are interacted with alternative specific dummy variables.

2/ As McFadden (1982 p. 11) states: "... it is not the MNL form per se, but rather the restriction of [the dependent variables] to depend only [our emphasis] on attributes of [alternative] i, that implies the IIA restriction".

It is immediately obvious that the model does not allow for complementarities. Furthermore, cross elasticities of any number of alternatives with respect to price or time of some other alternative m are always constrained to be equal. 1/

In practice, the restricted version of the multinomial logit model is not expected to yield significant changes in the coefficients of the socioeconomic variables. This is not so in the case of travel time variable where actual and spurious correlations (the correlation between the nurse and doctor travel times was 0.61) may have biased the estimates in the unrestricted model.

Results of the restricted version of the multinomial logit model are given in Table 4.3A. As anticipated the coefficients of the various socioeconomic variables remain fairly stable compared with the previous MNL model. There is no significant change in the own-time effect in the nurse alternative. In the doctor alternative, the coefficient of travel time was reduced by nearly one half.

New elasticity estimates on the basis of the restricted model are presented in table 4.3B. Although the all own-time and cross-time effect have decreased in absolute values, the basic results of both MNL versions are the same. The t-values tend to be slightly higher in the restricted model. However, the unrestricted model does better in term of goodness-of-fit criteria. Since both models were estimated on the same sample and with the

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1/ This does not present a problem in the trinomial case. However, if we were able to add a fourth alternative, say healers, this would imply that the cross-price elasticity of doctor visits with respect to healers and the cross price elasticity of nurse visits with respect to healers are always equal.

TABLE 4.3A: Restricted Multinomial - Logit Model
All Adults

	Nurse Alternative β	Nurse Alternative t	Doctor Alternative β	Doctor Alternative t
Constant	2.28	(4.46)	2.180	(3.44)
Doctor travel time			-1.160	(4.35)
Nurse travel time	-0.658	(4.89)		
Income	0.202	(2.48)	0.255	(2.32)
Age	-0.047	(5.31)	-0.032	(4.68)
Male	-0.061	(0.42)	0.046	(2.07)
Education	-0.073	(1.54)	-0.002	(0.30)
Adults	-0.053	(1.95)	-0.077	(1.79)
Children	0.038	(1.71)	0.039	(1.11)
Unrestricted days	-0.102	(4.67)	-0.129	(4.44)
Unrestricted days x Age	0.002	(3.69)	0.001	(2.49)
Savanna	0.035	(0.20)	-0.280	(0.93)
Log likelihood	-966.73			
χ^2	180.18			

TABLE 4.3B: Income and Travel Time Elasticities

	Nurse Alternative	Doctor Alternative
Income elasticity	0.154	0.219
<u>Travel time elasticity</u>		
Nurse	-0.261	0.107
Doctor	0.072	-0.953

same set of alternative, their likelihood ratios are directly comparable. We can thus construct a likelihood ratio test for the null hypothesis that cross-time coefficients are zero.

$$\chi^2 \doteq -2\bullet\ln\left(\frac{L(\hat{\beta}_2)}{L(\hat{\beta}_1)}\right)$$

$\hat{\beta}_1$ denotes the coefficients from the unrestricted model, while $\hat{\beta}_2$ denotes the coefficients from the restricted model. The test yielded a χ^2 value of 1.4, compared with $\chi^2_{22,.010} = 42.0$. Consequently the null hypothesis of zero cross-time effects can not be rejected.

C. Number of Consultations with Doctors and Nurses

In this section we turn to the actual "quantity" of care demanded, measured by the number of visits to each type of provider. Demand is estimated conditional on entering the health care market, i.e. for all individuals with positive visits. In order to correct for sample selection bias we used a two step procedure described in Section (3.1). The selection term was generated from the restricted MNL estimates, which were drawn from the pooled adult sample. Consequently the quantity-demand equations were also estimated from the pooled sample.

Table 4.4A shows results obtained from both OLS and the two-step procedure. Selection terms in both the nurse alternative and the doctor alternative were not significant (implying that selectivity bias does not arise) and differences between the parameter vectors of the OLS and two step procedures were minor.

The coefficients of all the demographic and health variables display the same signs in both the doctor and nurse alternatives. However, these variables matter more in the doctor alternative where they are more significant and larger in magnitude. The demographic variables with the greatest impact on doctor consultations are the number of adults and the number of children in the household. There is a negative association between the number of adults and utilization and a positive association between the number of children and utilization. Since the interpretation is the same as in the previous provider choice model, we need not discuss it here.

While the education variable had no effect on the decision to chose a doctor, it has a significantly negative effect on the amount of doctor consultations. This result is compatible with the notion that more education makes people more efficient at "home production" of health and therefore it reduces the amount of medical care required (Grossman, 1972).

It is also interesting to note that being a male has a significantly positive and large effect on the number of doctor consultations, and a negligible effect on nurse consultations. The provider choice model indicated that males are more likely to obtain health care provided by doctors and less likely to obtain care provided by nurses. If indeed doctors provide higher quality health care then these results imply that households bias their allocation of health care in favor of males.

Although the economic variables, i.e. travel time and income fail to attain critical t-values with the exception of the own-time parameter in the nurse alternative, the results do confirm and augment conclusions drawn from the provider choice model. Negative own time effects and positive cross time effects indicate that travel time replaces the conventional price mechanism and that medical care provided by nurses and medical care provided by doctors are indeed substitutes. Since selectivity bias did not arise, income and travel time elasticities reported in Table 4.3B are based on OLS estimates.

TABLE 4.4A: Demand For Medical Consultations OLS and Two-Step Estimates (ADULTS)

	Nurse Alternative				Doctor Alternative			
	β	T	β	T	β	T	β	T
Constant	2.275	(5.62)	1.96	(3.75)	2.010	(3.06)	1.402	(1.66)
Doctor travel time	0.149	(1.10)	0.143	(1.03)	-0.737	(1.01)	-0.813	(1.11)
Nurse travel time	-0.267	(1.67)	-0.232	(1.54)	0.550	(0.84)	0.687	(1.04)
Income	0.141	(1.66)	0.106	(1.25)	0.150	(0.97)	0.112	(0.71)
Age	0.007	(1.17)	0.010	(1.51)	0.002	(0.25)	0.010	(0.86)
Male	0.095	(0.68)	0.088	(0.68)	0.501	(1.68)	0.436	(1.70)
Education	-0.033	(0.83)	-0.028	(0.40)	-0.092	(1.50)	-0.089	(1.99)
Adults	-0.039	(1.19)	-0.031	(0.87)	-0.164	(2.36)	-0.150	(2.01)
Children	0.059	(2.34)	0.052	(1.97)	0.130	(2.44)	0.122	(2.30)
Unrestricted days	0.021	(0.66)	0.028	(0.88)	0.083	(1.64)	0.107	(1.95)
(Unrestricted days) 2/	-0.002	(1.64)	-0.002	(1.61)	-0.003	(1.58)	-0.003	(1.77)
Selection term			1.810	(0.98)			2.918	(1.54)
R^2	0.102		0.105		.103		0.124	
F value	3.600		3.37		1.250		1.400	
Sample size	330 a/				109			

a/ Excluding observations with more than 7 consultations.

TABLE 4.4B: Elasticities of Quantity Demand (Adults, Conditional Upon Market Entry)

	Nurse Consultations	Doctor Consultations
Income elasticity	0.075	0.098
Travel-time elasticities		
Nurse	-0.043	0.066
Doctor	0.051	-0.155

These estimates apply strictly to the conditional sample of entrants to the health care market and not to the whole population. Section V considers the full market response to economic variables.

4.2 Demand for Child Health Care

A. Entry to the Health Care Market

Our analysis of health care utilization on behalf of children follows the sequence laid out in the previous section, namely the market-entry decision, a provider choice model and finally the demand for consultations. Initially, the sample of children was divided into two age groups: infants or toddlers under the age of six, and children between ages six an fifteen. The test for pooling previously described indicated that pooling these age groups may not be appropriate in the binary market-entry regressions but is acceptable in the multinomial logit model of provider choice. 1/

As in the analysis of adult health care we begin this study by first posing the question, what determines whether an ill or injured child will obtain health care, not distinguishing between the various types of health workers sought. Table 4.5 shows results for all age categories, including the pooled category.

The vector of independent variables in the child regressions is similar to the vector independent variables in the adult regressions, but there are several important differences. In order to control for non-

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1/ In the binary case the Wald test yielded a statistic of 29.7, in the multinomial case the test statistic was 39.9.

linearities in the age effect, we introduced an age spline representing the effect of additional years beyond the age of five. This variable turned out to be statistically significant an it improved the overall fit of the model. The age spline shows that infant and toddlers are less likely to obtain medical care as they get older, whereas in later years the overall effect of age is positive. Another change in the use of years of education of the father instead of own-education. The father's education was preferred over the customary mother's education in the light of trial regressions (OLS and Logit) which included either one of these correlated variables. The coefficients consistently turned out to have the same sign, although father's education usually possessed a higher asymptotic t-value.

The healthiness measure of children under the age of six is not unrestricted activity days but rather the number of healthy days during the four-week recall period. As was stated earlier, we assume that the adults decision-makers in the household determine the threshold of sick days which justify entry into the child health care market. Therefore, we interact a proxy for adult tastes, namely the father's education, with the health variable.

A number of socioeconomic variables has the same impact as in the adult population. In particular, the number of adults in the household reduces the probability of obtaining medical care, while the number of children increases this probability. Although the relative healthiness does not seem to matter in the case of children between ages six and fifteen, it remains as a significant negative determinant of market entry in the aggregated sample. Similarly, there are no significant differences between the probabilistic market entry elasticities of children and adults. The income elasticities of the aggregated adult sample and the aggregated child samples are 0.16 and 0.13. Their respective travel time elasticities are 0.15 and 0.30. It is interesting to note that travel time has the same impact on infants as on prime age adults, perhaps reflecting the fact that parents or certain other adults in the household necessarily devote some of their own time in order to obtain medical care for the child.

B. Provider Choice Model

As was mentioned above, test statistics allow us to pool the two age groups in the provider choice model. 1/ Separate MNL regressions for the two subsamples revealed that education and the education-health interaction were the only variables with different signs across age groups. Therefore, we allow the parameters of these variables to vary by age group in the pooled MNL regression.

Tables 4.8A shows the results of the provider-choice model on behalf of children, which is analogous to the restricted MNL model in Section (4.1). The parameters in the nurse alternative are generally more significant than the parameters in the doctor alternative, probably due to the differences in the sample size, in each alternative. Nevertheless, certain parallels emerge across these alternatives. As in the adult provider choice model, travel time is the major determinant of utilization. On the other hand the income parameter, while positive in both alternatives, does not attain

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1/ Another reason for pooling is the small number of observations with positive utilization of doctor services. Only fifty-nine children under the age of sixteen were seen by doctors, compared with 165 infants and 137 older children who were seen by nurses.

TABLE 4.5: Determinants of Decision to Seek Health Care Infants and Children (LOGIT)

	Infants			Older Children			All Children		
	β	T	Marginal Effect	β	T	Marginal Effect	β	T	Marginal Effect
Constant	1.62	(3.77)	0.40	-0.07	(0.61)	-0.018	1.18	(3.56)	0.291
Average total time	-0.95	(4.13)	-0.237	-0.83	(3.44)	-0.202	-0.86	(5.31)	-0.22
Income	0.21	(2.02)	0.053	0.10	(0.85)	0.025	0.16	(2.06)	0.040
Age	-0.20	(3.06)	-0.050	0.01	(0.28)	(0.003)	-0.17	(3.27)	-0.043
Age spline (age > 5)							0.22	(2.84)	0.053
Male	-0.01	(0.04)	-0.002	0.02	(0.15)	0.005	0.08	(0.05)	0.003
Education	-0.10	(1.08)	-0.025	0.56	(1.49)	-0.136	-0.03	(0.34)	-0.007
Adults	-0.09	(2.36)	-0.023	-0.12	(2.32)	-0.030	-0.11	(3.42)	-0.026
Children	0.06	(1.91)	0.015	0.12	(3.14)	0.030	0.09	(3.65)	0.022
Unrestricted days	-0.04	(2.94)	-0.011	-0.01	(0.41)	-0.002	-0.03	(2.57)	-0.007
Unrestricted days x father's education	-0.01	(1.52)	0.001	-0.02	(1.58)	-0.006	0.00	(0.33)	0.003
Savanna	0.22	(0.79)	0.054	-0.12	(0.42)	-0.029	0.06	(0.29)	0.014
Log Likelihood		-271.26			-239.22			-515.68	
X^2		49.95			40.01			80.79	
Income elasticity		0.161			0.086			0.128	
Travel time elasticity		-0.310			-0.298			-0.299	

TABLE 4.6A: Multinomial Logit Model of Provider Choice (Children)

	Nurse Alternative β	t	Doctor Alternative β	t
Constant	1.218	(3.17)	0.596	(0.913)
Doctor travel time			-2.102	(4.02)
Nurse travel time	-1.243	(6.81)		
Income	0.154	(1.78)	0.293	(2.13)
Age	0.262	(3.96)	-0.090	(0.78)
Age spline (age > 5)	-0.261	(3.16)	0.117	(0.79)
Male	0.054	(0.34)	-0.325	(1.12)
Adults	-0.110	(3.32)	-0.071	(1.18)
Children	0.097	(3.65)	0.016	(0.35)
Father's education a/	0.059	(0.65)	-0.292	(1.02)
Unrestricted days a/	-0.037	(2.86)	0.042	(2.00)
Unrestricted days x Father's education a/	0.004	(0.94)	0.011	(0.94)
Fathers education b/	0.590	(1.53)	1.633	(1.22)
Unrestricted days b/	-0.013	(0.98)	-0.042	(1.90)
Unrestricted days x Father's education b/	-0.249	(1.59)	-1.100	(1.06)
Savanna	0.435	(2.05)	-1.123	(1.79)
Log likelihood	-637.83			
χ^2	158.00			

a/ Specific to infants less than 6 years of age.
b/ Specific to children age 6-15.

TABLE 4.6B: Income and Travel Time Elasticities From Provider Choice Model (All Children)

	Nurse	Doctor
Income Elasticity	0.121	0.316
Travel Time Elasticities		
Nurse	-0.348	0.208
Doctor	0.005	-1.055

critical t-values. A comparison of tables 4.3B and 4.6B shows that travel time elasticities in the sample of children are generally higher than travel time elasticities of adults. However, the basic results remain the same: own-time effect are negative and large, the absolute value of own-time elasticities in the doctor alternative exceed unity and cross-time effects are always positive but small. Although income effects are consistently positive in the provider choice models, there are certain differences between the two samples. In the adult sample the elasticities of the nurse and doctor choices were quite similar (0.12 and 0.19 respectively).

In the children sample the income elasticity of the nurse choice was very small (0.12) while the income elasticity of the doctor choice was relatively high (0.32). Recall that higher income elasticities in the doctor alternative consistently appeared in the adult models as well. A possible explanation is that although health services are nominally free, there are certain costs of higher quality care (i.e. doctors) which are not observed by the researcher. Consequently, income is a more important determinant of utilization of high quality medical services.

C. Number of Consultations with Doctors and Nurses

The demand equations for nurse and doctor consultations were estimated with OLS and the two step procedure previously described. Results are given in Table 4.7A. Since the sample size in the doctor alternative is very small, we will not pay much attention to the demand equation in this alternative. The selection term was not significant in either case and the parameter estimates in the two-step method are not significantly different from the OLS estimates. For convenience, the following discussion will refer to the conditional sample of market entrants, namely to the OLS regressions. The demand equation in the nurse alternative suggests that relatively healthier children tend to obtain a greater amount of medical care. The negative sign of the quadratic healthiness term implies that the positive association between healthiness and utilization of nurse services is reversed when children become severely ill. This result confirms previous findings in the case of adults.

Given a child's state of health, demand is dominated by economic variables rather than demographic traits. Travel time and income elasticities are given in Table 5.7B.

As in all of the previous cases, travel time effects had the expected signs, and income elasticities are low. Note that there are minor differences between elasticities in the doctor alternative and the nurse alternative. Furthermore, a comparison of Tables 4.4B and 4.7B shows that elasticities of demand for adult consultations and elasticities of demand for child consultations are in the same order of magnitude.

The little evidence that does exist in the developed world, particularly the United States, reflects substantially higher income elasticities for pediatric health care visits compared with adults visits. Studies by Inman (1976), Colle and Grossman (1978) and Goldman and Grossman (1978) show that income elasticities of pediatric visits conditional upon positive utilization range from 0.16 to 1.32 compared with an income elasticity of 0.07 for pediatric nurse visits in Côte d'Ivoire. One possible explanation of this disparity is that since health care services are provided free-of-charge in rural Côte d'Ivoire, out-of-pocket expenditures there represent a relatively small share of income. Another possibility is that given the extended family structure, rural Ivorian households have a greater freedom to select persons with low opportunity costs of time to accompany children.

TABLE 4.7A: Demand for Medical Consultations (Children) OLS and Two Stage Procedures

	Nurse Alternative				Doctor Alternative			
	β	T	β	T	β	T	β	T
Constant	1.556	(3.57)	1.341	(2.19)	3.063	6.34	3.076	(6.32)
Doctor travel time	0.325	(2.14)	0.321	(2.19)	-0.331	(0.40)	-0.492	(0.59)
Nurse travel time	-0.764	(2.94)	-0.678	(2.17)	-0.064	(0.09)	0.096	(0.13)
Income	0.168	(1.64)	0.150	(1.64)	0.001	(0.01)	0.054	(0.34)
Age	-0.050	(0.76)	-0.027	(0.34)	-0.017	(0.16)	-0.035	(0.32)
Age spline	0.063	(0.65)	0.035	(0.32)	0.134	(0.93)	0.175	(1.18)
Male	0.166	(0.86)	0.165	(0.86)	0.003	(0.01)	-0.022	(0.08)
Education	0.033	(1.05)	0.032	(1.02)	0.021	(0.42)	0.032	(0.61)
Adults	-0.063	(1.65)	-0.048	(1.46)	-0.167	(2.16)	-0.169	(2.19)
Children	0.042	(1.35)	0.031	(0.79)	0.134	(2.07)	0.125	(1.90)
Unrestricted days	0.009	(1.94)	0.094	(2.00)	-0.142	(2.05)	-0.146	(2.11)
(Unrestricted days) ^{2}	-0.003	(2.30)	-0.003	(2.38)	0.004	(1.70)	0.004	(1.65)
Selection term			0.403	(0.50)			-3.66	(1.12)
R^2	0.054		0.050		0.289		0.309	
F Value	2.040		1.898		1.592		1.580	
Sample size			295 [a]				51 [a]	

[a]/Observation with 1-7 consultations.

TABLE 4.7B: Elasticities of Quantity-Demand (Children, Conditional Upon Market Entry)

	Nurse alternative	Doctor alternative
Income elasticity	0.076	0.000
<u>Travel Time Elasticities</u>		
Nurse	-0.120	-0.030
Doctor	0.087	-0.067

V. Summary and Conclusion

5.1 Total Utilization Response

In this paper we estimated various health care demand models in order to assess the extend of quantity rationing in the health care system in Côte d'Ivoire. Quantity rationing was defined as the effect of travel time to the nearest provider on the decision to seek medical care, on the choice of the health care provider and on the total number of calculations with each provider.

We summarize our main results in Table 5.1. Note that total demand, M_j, for services of provider j is given by

$$M_j = P_j \cdot (N_j | N_j > 0)$$

where P_j is the probability of choosing j, and N_j is the number of consultations with j, only observed if j is chosen.

Thus:

$$\frac{\partial M_j}{\partial X} = P_j \frac{\partial N_j}{\partial X} + N_j \frac{\partial P_j}{\partial X}$$

for any exogenous variable X. We evaluate the total demand elasticity for provider j, E_j as

$$E_j = \varepsilon_j + \eta_j$$

i.e., the sum of the probability elasticity of demand (e.g.) and the conditional elasticity of demand for consultations.

TABLE 5.1: Total Demand Elasticities

	Nurse alternative	Doctor alternative
	Adults	
Income elasticity	0.229	0.317
Travel Time Elasticities		
Nurse	-0.304	0.173
Doctor	0.123	-1.108
	Children	
Income elasticity	0.198	0.316
Travel Time Elasticities		
Nurse	-0.468	0.178
Doctor	0.092	-1.122

The results in Table 5.1 clearly show that in the absence of user fees, travel time acts as a rationing mechanism in the health care market. It also seems appropriate to state that access to higher quality care, i.e. doctors, is always completely restricted by long travel times. On the other hand, because medical care is free, income elasticities in the Ivorian health care market are relatively low, much like they are in the developed countries in which the market for medical care is generally characterized by a high level of insurance coverage.

5.2 Policy Implications and Conclusion

The case against user fees in the health care market stems from the desire to allow everyone who needs it, free access to medical care. However, while money prices may be zero, as they are in rural Côte d'Ivoire, private costs to the patients may still be considerable. As we have shown in this paper, the absence of user fees per se does not guarantee equal access for everyone. In fact, the private costs (here represented by travel time), much like a money price, serve as a rationing mechanism, with those living farther from health care facilities being most restricted. Thus, the case against user fees can not be based on some a priori notion of equity.

Furthermore, our results imply that the demand for medical care in rural areas can be significantly increased if the regional distribution of health care providers is improved. Such an improvement could be used to offset the expected negative impact on the demand for medical care that is likely to result from the introduction of user fees. Conversely, if the new revenues obtained from user fees are being used to improve the regional distribution of providers, the resulting system can turn out to be more equitable, rather than less equitable as is usually feared.

The outcome, of course, depends on many issues that need further examination. Among them: for which medical services should fees be set; can the fees result in sufficiently high revenues for improving the system; do fees have the same impact on poor and rich households, or should fees be made income dependent?

Answers to these questions depends on the money price elasticity of demand, the willingness-to-pay for medical care and the cost structure of health care facilities. Research is under way within the World Bank's Living Standards Unit to address these issues in order to help policy makers make the difficult decisions necessary to solve the severe financial problems that are prevalent in the health care delivery systems of many LDCs.

Appendix A

A Note on Traditional Healers

There is little evidence about the role of traditional healers in developing countries. In the past it has been suggested that some indigenous forms of medicine may be effective and can be integrated into the health care system (The World Bank, 1980). The Ivorian Living Standards survey contains no data relating practices of faith healers or the types of symptoms treated by them. However, ample data on levels of utilization was collected. The data suggests that although traditional medicine is significant in the rural parts of Co^te d'Ivoire, it is practically non-existent in urban locations. 1/

In rural areas 118 persons of all ages consulted a healer compared with only 9 persons in urban locations. Of the fifty villages for which community level data was collected, all but four had a traditional healer on premise. Table 7.1 shows the distribution of visits by age group and place of consultation. The largest proportion of visits occurred in prime age adults. However, after adjusting for population shares it becomes evident that there are no appreciable differences between age groups. Similarly, there are no appreciable differences between sexes (see Table 7.2). A major amenity offered by traditional healers are home visits. Roughly 40 percent of traditional health care episodes took place in the patient's home, while only

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1/ Nevertheless, there were too few observations with positive utilization of traditional medicine in the "cleaned" estimating sample to allow for statistical analysis. We could not obtain correct predictors of fees charged by healers, for instance; furthermore, traditional medicine could not be distinguished from other types of home care. Consequently, we incorporated traditional care in the "home care" alternative.

a negligible number (about 10) of the doctors and nurses in the rural sample made any home visits. Furthermore, healers did not charge for services provided to 67 of the 118 "patients" in the rural sample. The average fee was 218 CFAF (47 cents in 1985 prices). The average number of traditional health care consultations excluding outliers with more than 10 visits, was about 2.7, similar to the average number of consultations with either doctors or nurses, given positive utilization.

TABLE A.1: Number of Persons with Healer Consultations Age Group by Place of Consultation [a]

	Healer's Home	Person's Home
Ages 0-5	19 (23)	11 (13)
Ages 6-15	8 (11)	11 (14)
Ages 16-49	27 (20)	17 (12)
Ages 50+	17 (17)	8 (8)
Total	71 (71)	47 (47)

a/ Figures in parenthesis denote number of persons with healer consultations adjusted for the actual population shares.

TABLE A.2: Number of Persons with Healer Contacts Age Group by Sex

	Male	Female
Ages 0-5	15	15
Ages 6-15	12	7
Ages 16-49	21	23
Ages 50+	12	13

Appendix B

Econometric Specification

In the analysis of discrete choice a distinction is made among utility levels associated with each alternative. Furthermore, the random utility maximization (RUM) hypothesis is usually invoked. 1/ In the binary case (easily extended to the case of multiple choices), RUM states that, 2/

$$U_1 = V_1 + \varepsilon_1$$
$$U_2 = V_2 + \varepsilon_2$$

U_1, U_2 are utility associated with each choice, V_1, V_2 are "representative" utility terms and $\varepsilon_1, \varepsilon_2$ are random, unobservable components of utility which vary across individuals. For convenience, subscripts denoting the individual were suppressed.

An individual will chosen the alternative that yields him the most utility. The probability that this individual chooses alternative 2 over alternative 1 is given by

$$P_1 = \text{Prob}(U_2 > U_1)$$

substitution yields

1/ See McFadden 1981.

2/ For an extension of RUM to the trinomial case see Hausman and Wise (1978).

$$P_1 = \mathrm{Prob}(V_2 - V_1 > \varepsilon_1 - \varepsilon_2)$$

This probability may be specified as a logit model,

$$P_i = \frac{e^{V_i}}{\sum_{j=1}^{J} e^{V_j}}$$

which in turn, is rewritten to reflect differences in representative utilities. The dichotomous market entry decision is written as a binary logit

$$P_2 = \frac{e^{\nu_2}}{1 + e^{\nu_2}}$$

where $\nu_2 = V_2 - V_1$

and the choice among several providers is modeled as a multinomial logit

$$P_i = \frac{e^{\nu_i}}{1 + \sum_{\substack{j=1 \\ j \neq k}}^{J} e^{\nu_i}}$$

where $\nu_j = V_j - V_k$

In the third part of our analysis we estimate separate demand equations for the number of doctor contacts and the number of nurse contacts a person had, conditional upon positive utilization of doctor or nurse services. Since our main concern is with price and income effects we opt for a simple linear specification adapted, with minor modifications, from Hausman (1981),

$$N_i = a^i P + bY + c\,[Z, H]$$

where N_i is demand for consultations with the i'th health care provider. Y is income, Z is a composite of demographic traits and H is an indicator of health needs, a^i is an alternative specific parameter, b is the income parameter and c is a vector of parameters. Following Action (1975) the theoretically correct price variable is the full price, which is the sum of the money price and the product of the opportunity cost of time (w) multiplied by the time devoted to consumption of medical care (t), that is $p + wt = P$. Health care in rural Côte d'Ivoire is provided free of charge. In the absence of wage data we will use travel time to the nearest provider as a proxy variable for the full price of obtaining medical care.

A general solution for an indirect utility function yielding the linear demand equation is 1/

1/ An easy way to verify that the above indirect utility function yields a linear demand function is to apply Roys identity

$$N = -\frac{\partial V/\partial P}{\partial V/\partial Y}$$

$$V_i = e^{-bP}\left(Y + \frac{1}{b}\left[a^i P + \frac{a^i}{b} + c\ (Z,H)\right]\right)$$

Since $V_1 > V_2$ only if $e^{-bP}\ V_1 > e^{-bP}\ V_2$ the decision maker effectively chooses an alternative on the basis of a comparison among

$$\tilde{V}_i = \frac{a^i}{b} + Y + a^i\ P + c\ (Z,\ H)$$

This function of representative utility is linear in prices, income and personal traits. Both the constant $\frac{a^i}{b}$ and the price effect vary across alternatives. Personal traits may be taken as indicators of the decision-maker's perceived quality of health care, or as "taste" variables that effect the utility derived from consuming services provided by the provider chosen. (For a more detailed discussion see Gertler et al. 1986). Note that in this formulation income is differenced out of the model. However, since income elasticities are of interest to us the income variable was reintroduced in the empirical model.

The advantage of this framework is that it allows us to consistently use the same simple specification for all stages of the analysis while closely conforming with utility maximization. It also enables us to calculate total market response elasticities presented in Section V.

Alternatively, we can estimate the market response using a selectivity bias approach developed in Lee (1983) and Trost and Lee (1984). In the first step the following selection term is generated from the multinomial logit model of provider choice:

$$\lambda = \phi(J(\beta_s^{'}X))/F(\beta_s^{'}X) \quad \underline{1}/$$

where β_s is the parameter vector of the chosen alternative, ϕ is the standard normal density function, and F is the cumulative normal distribution. Letting Φ denote the standard normal distribution function, we also have the transformation $J = \Phi^{-1}F$. Detailed proof is given in the above references. Note that there are unique selection terms for the doctor alternative and for the nurse alternative. In the second stage we estimate separate OLS regressions on doctor contacts and nurse contacts, where λ is included among the explanatory variables. A high asymptotic t-value on the parameter of λ indicates that sample selection is present. Thus the presence of λ in the demand regressions corrected for sample selection thereby yielding consistent parameter estimates.

Several factors will help us identify the demand equations. First the selection term is highly non-linear. Second, we include a taste parameter in the discrete choice model which affects the decision maker's choice of a health care provider but not the actual amount of health care obtained (Savanna). Finally, the functional form of the "healthiness" assessment variable in the discrete choice model differs for the healthiness measure in The quantity demand equation for reasons given in Section III.2.

Results obtained from OLS regressions and the two step procedure are compared in Section IV.

Appendix C

Derivation of Elasticities

Elasticity is defined as the percentage change in variable Y with respect to a percentage change in another variable X. (The individual's subscript is suppressed for convenience) generally:

$$E = \frac{\partial Y}{Y} / \frac{\partial x}{x} = \frac{\partial Y}{\partial x} \cdot \frac{x}{Y}$$

In the case of discrete choice variables the above formula is given in probabilistic terms, i.e. Y is replaced by the predicted probability of choosing any given alternative. The marginal effect, $\partial Y/\partial x$ is derived below. We may then ask, what is the change in the probability of choosing alternative j as x varies?

A simplified elasticity formula is available for binary logit.

$$E^{P_j}_{x_{jk}} = \beta_{jk} x_{ijk} (1-P_j) \quad \underline{1/}$$

This formula also applies to a special variant of the multinomial logit model, where at least some of the explanatory variables are alternative specific. With this specification, the probability of choosing a doctor, for instance, depends only on travel time to a doctor, not on travel time to a

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1/ This may be calculated using the means of $\tilde{x}_i$ and the predicted probability (P_i) or as an average of all individual elasticities. We used the latter method.

nurse or healer. (This model is known as conditional logit, or McFadden's multinomial Logit.)

PROOF

For generality we derive the proof for McFadden's multinomial logit, with J alternatives and at least one alternative specific variable; x_j should be thought of as a vector of dependent variables in alternative j, with a corresponding coefficient vector β_j We are interested in the marginal effect of the k'th alternative specific variable.

$$P_j = \frac{e^{\beta_j' x_j}}{\sum_{j=o}^{J} e^{\beta_j' x_j}} \qquad \underline{1}/$$

Using the quotient rule:

$$\frac{\partial P_j}{\partial x_{jk}} = \frac{(\Sigma\, e^{\beta_j' x_j}) \dfrac{\partial e^{\beta_j' x_j}}{\partial x_{jk}} - e^{\beta_j' x_j} \dfrac{\partial\, \Sigma\, e^{\beta_j' x_j}}{\partial x_{jk}}}{(\Sigma\, e^{\beta_j' x_j})^2}$$

$$= \frac{(\Sigma\, e^{\beta_j' x_j})\,(e^{\beta_j' x_j})\,\beta_{jk} - (e^{\beta_j' x_j})\,(e^{\beta_j' x_j})\,\beta_{jk}}{(\Sigma\, e^{\beta_j' x_j})^2}$$

$\underline{1}/$ Binary logit is a special case of MNL, where $P_j = \dfrac{e^{\beta' x_j}}{1 + e^{\beta' x_j}}$

Using the definition of P_j:

$$\frac{\partial P_j}{\partial x_{jk}} = P_j \ \beta_{jk} - P_j^2 \beta_{jk}$$

Hence

$$E_{jk}^{P_j} = P_j \ \beta_{jk} \ (1 - P_j) . \ \frac{x_{jk}}{P_j}, \text{ Yielding}$$

$$E_{jk}^{P_j} = P_j \ \beta_{jk} \ x_{jk} \ (1-P_j) \quad \underline{1}/$$

In our case, however, each alternative faced the same vector of explanatory variables. (The probability of choosing say, a doctor depended on travel times to each type of practitioner). For convenience we will assume that there is only one dependent variable, x_k. Therefore, the marginal probability of selecting the j'th alternative with respect that variable is

$$\frac{\partial P_j}{\partial x_k} =$$

$$\frac{(\Sigma \ e^{\beta_j x_k}) \ (e^{\beta_j x_k}) \ \beta_j - (e^{\beta_j x_k}) \bullet (e^{\beta_0 x_k} \ \beta_0 + e^{\beta_1 x_k} \ \beta_1 \ \ldots + e^{\beta_J x_k} \beta_J)}{\left(\Sigma \ e^{\beta_j x_k}\right)^2}$$

$\underline{1}/$ In the presence of an interaction term, between say, variable x_k and variable x_{k+1}, the elasticity formula is simply

$$P_j \ x_{jk} \ (\beta_{jk} + \beta_{jk+1} \ x_{k+1}) \ (1 - P_j)$$

Before simplifying invoke the normalization $\beta_0 = 0$ (see Maddala, p. 42), now the expression above reduces to:

$$\frac{\partial P_j}{\partial x_k} = P_j \beta_j - P_j \sum_{j=1}^{J} P_j \beta_j$$

Elasticity now becomes

$$E_k^{P_j} = (\beta_j - \sum_{j=1}^{J} P_j \beta_j) x_k$$

Elasticities reported in Tables 4.4B and 4.7B are based on this formula.

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The Demand for Medical Care in Developing Countries: Rationing in Côte d'Ivoire — The World Bank

Living Standards
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Health Care Financing and the Demand for Medical Care

Paul Gertler
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Health Care Financing and the Demand for Medical Care

The Living Standards Measurement Study

The Living Standards Measurement Study (LSMS) was established by the World Bank in 1980 to explore ways of improving the type and quality of household data collected by statistical offices in developing countries. Its goal is to foster increased use of household data as a basis for policy decisionmaking. Specifically, the LSMS is working to develop new methods to monitor progress in raising levels of living, to identify the consequences for households of past and proposed government policies, and to improve communications between survey statisticians, analysts, and policy makers.

The LSMS Working Paper series was started to disseminate intermediate products from the LSMS. Publications in the series include critical surveys covering different aspects of the LSMS data collection program and reports on improved methodologies for using Living Standards Survey (LSS) data. More recent publications recommend specific survey, questionnaire and data processing designs, and demonstrate the breadth of policy analysis that can be carried out using LSS data.

LSMS Working Paper
Number 37

Health Care Financing and the Demand for Medical Care

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The World Bank
Washington, D.C., U.S.A.

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ABSTRACT

This LSMS working paper includes two reports that are part of a larger study on "Health Care Demand and Resource Mobilization". 1/ This study addresses the issue of how various financing systems for medical care influence its utilization. Emphasis is on the impact of introducing (or raising) user fees, in terms of distributional effects, welfare consequences and revenue potential.

The first paper develops a discrete choice model that allows for the quantification of the effects of price and non-price variables on a person's decision of whether or not to obtain medical care, and if so, from which provider. The empirical work is based on recent data from a Peruvian health survey. The second paper estimates a variant of this model, using data from the 1985 Ivorian Living Standards Survey.

The major message of both papers is that in the absence of user fees (or at low fee levels) private costs (here represented by travel time to the nearest provider) take over the rationing role of the conventional price mechanism. The first paper shows how the quantification of this effect can be used to simulate the distributional and welfare consequences of changing the fee structure.

None of the results in these papers should be judged as final, if only because both papers focus on provider choice rather than on total medical consumption. However, the main empirical results appear to be robust, and the effect of non-price rationing is found to be much stronger than previously reported in the literature.

1/ Each report is self-contained which results in a certain amount of overlap in the exposition.

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I. Are User Fees Regressive?
The Welfare implications of Health Care Financing Proposals in Peru

I. INTRODUCTION

Many developing countries have created extensive publicly supported health care systems, access to which is at little or no cost. 1/ The financial crisis of the 1980s has forced many of them to consider instituting user fees (i.e. charge individuals for access). Those in favor of user fees argue that they facilitate recovery of the cost of providing the service, and, if they are set at marginal cost, improve allocative efficiency. 2/ The strongest argument against user fees is that they may be regressive in that they may not allow all income groups equal access to medical care because the poor may be more price sensitive than the rich. Even if everyone is equally price sensitive, user fees will be regressive if the welfare loss for the poor relative to income is larger than for the rich.

In the absence of user fees, equal access is still not assured. It has been well known since Acton (1975) that nonmonetary access costs such as travel time are important determinants of health care choices. The geographical distribution of services may make access more difficult for some groups. For example, locating facilities closer to the upper and middle classes discriminates against the poor. User fee proponents argue that revenues can be reinvested to reduce nonmonetary access costs, and consequently minimize consumers' welfare loss.

Since user fee proposals are so widespread and the potential welfare effects so large, it is important that some *ex ante* analysis be performed. This paper provides a methodology for such an *ex ante* analysis, and to our knowledge, the first estimates of expected revenues and welfare losses (measured as compensating variations) associated with one such proposal.

The analysis requires estimation of the demand for health care, from which the revenues and welfare changes of proposed user fees can be simulated. The magnitude of the revenue and welfare effects depend crucially on the price elasticity of demand. Previous studies in developing countries have found little if any impact of price on demand. These studies model the demand for health care as a discrete choice between alternative providers, with the price effect specified to be independent of income. [3/] This assumption is extremely restrictive, since one would expect the wealthy to be less sensitive to price differences across providers than the poor. Indeed, we show that this specification is inconsistent with stable utility maximization, and that, if health is a normal good, the demand for health care must become more price elastic as income falls.

The discrete choice specification in this paper is derived from a theoretical model that implies a natural interaction between price and income in the demand functions, and those demand functions are estimated using a parsimonious flexible functional form that allows the data to determine the effect of income on price elasticities. The resulting model facilitates the study of the distributional impacts of user fees.

The empirical investigation considers the potential effects of user fees in urban Peru. The estimates show that price plays an important role in health care demand. Further, demand becomes more elastic as income falls indicating, as expected, that health is indeed a normal good. This implies that the introduction of health care user fees in Peru would reduce access proportionally more for the poor than the rich, and, in this sense, be regressive. Our simulations demonstrate that while user fees would generate substantial revenues, they would also generate substantial reductions in aggregate consumer welfare with the burden of the loss on the poor. The simulations also indicate that the welfare loss from the current spatial distribution of public health care services is roughly equal to the expected welfare loss from moderate user fees, and that the loss is fairly evenly distributed across income groups. Therefore, if the government imposed moderate user fees and used the revenues to solve the rationing problem, there would be little if any aggregate welfare loss, but there would be a redistribution of welfare from poor to rich.

II. BEHAVIORAL ASSUMPTIONS

The framework for this discussion is a static model in which utility depends on health and consumption of goods other than medical care. When an illness or accident is experienced, individuals must decide whether to seek medical care. The benefit from consuming medical care is an improvement in health, and the cost of medical care is a reduction in the consumption of other goods. Individuals not only have to decide whether to seek care, but also what type of care. They are faced with a set of alternative providers, each of which has a different potential impact (efficacy) on their health. This efficacy depends on providers' skills, individuals' characteristics (e.g. medical problems, general health status, and ability to implement the recommended treatment plan), and a random term that captures the notion that the efficacy of medical care is not deterministic. An individual's expectation of this impact can be viewed as the perceived quality of care.

In essence, individuals are faced with a discrete choice decision. A choice must be made between the various provider alternatives, including self-care. Each alternative offers a set package (quality) for a given price, where the price includes both monetary outlays and nonmonetary access costs such as travel and waiting time. Based on this information, their health statuses, types of medical problems, and incomes, individuals choose the alternatives that yield the greatest utilities.

We consider the short run utility maximization problem faced by an individual who has recently experienced an accident or illness. Let the utility, conditional on receiving care from provider j, be given by

$$U_j = U(H_j, C_j, T_j) \quad , (1)$$

where H_j is expected health status after receiving treatment from provider j, C_j is expenditures on consumption after paying provider j, and T_j is the nonmonetary cost of access to provider j.

The health care purchased from provider j is invested in health. The perceived quality (marginal product) of provider j's medical care is the expected improvement in health. Let H_0 be expected health status without professional medical care (i.e. self-treatment); then, the perceived quality of provider j's care is $Q_j = H_j/H_0$, which yields an expected health care production function of the form

$$H_j = Q_j \, H_0 \ , (2)$$

where H_j is proportional to H_0. The quality parameter depends upon provider characteristics (e.g. training and facilities) and individual characteristics (e.g. type and severity of illness).

This production function takes on a rather simple form for the self-care alternative. Since H_j equals H_0, the proportionality factor is unity for the self-care alternative. In effect, this normalizes the health care production function so that the quality of a particular provider's care is measured relative to efficacy of self-care.

The level of consumption expenditure conditional on choosing provider j, C_j, is derived from the budget constraint. Let P_j be provider j's price and Y be income, then

$$C_j = Y - P_j \ , \ (3)$$

with $C_j \geq 0$required for feasibility. 4/ Substitution of (3) into (1) yields

$$U_j = U(H_j, Y - P_j, T_j) \ .$$

Income affects utility through the consumption term, and is assumed to be exogenous. 5/

Now we are ready to specify the utility maximization problem. Suppose the individual has J+1 feasible alternatives (with the j=0 alternative being self-care). The unconditional utility maximization problem is

$$U^* = \max(U_0, U_1, \ldots, U_J) \ , \ (4)$$

where U* is the highest utility the individual can attain.

If health is a normal good, then the demand for health increases with income. A necessary condition for normality is that as income rises, the marginal rate of substitution of consumption for health diminishes, holding health constant. This point is demonstrated in figure 1, where the continuous choice case with health being a normal good is pictured. As income rises the point of utility maximization moves out from the origin along the expansion path. Holding health constant at A, we move to the right along the horizontal line as income rises, intersecting the indifference curves at points of flatter slopes, implying a diminishing marginal rate of substitution.

In a discrete choice world, normality implies that as income rises individuals are more likely to choose the "higher price/higher quality" options. Here as well, a necessary condition for normality is that as income rises, the marginal rate of substitution of consumption for health diminishes, holding health constant. This is demonstrated in figure 2, where the discrete choice case with health as a normal good is pictured. In figure 2, there is a choice between a "high price/high quality" option (P_h, Q_h), and a "low price/low quality" option (P_ℓ, Q_ℓ). At a low income level, say Y_ℓ, the choice is between points A and B; i.e. between a gain in health of (H_h - H_ℓ) and a gain in consumption of (P_h - P_λ). At income Y_ℓ, the additional consumption is preferred to the additional health and the "low price/low quality" option B is chosen. The high income individual with income Y_h has a choice between points C and D. These points represent the same tradeoff between health and consumption as points A and B. As income rises the marginal rate of substitution of consumption for health falls along both horizontal lines H_h and H_ℓ. Eventually, at some income between Y_ℓ and Y_h, the gain in health is preferred to the gain in consumption. At income Y_h, the "high price/high quality" option C is chosen.

In a discrete choice world, if health is a normal good, a rise in income increases the likelihood that individuals purchase "higher price/higher quality" alternatives. Another way of looking at this is that an increase in price is less likely to dissuade richer individuals from choosing the "higher price/higher quality" alternatives. In a probabilistic sense, normality implies that richer individuals are less price elastic than poorer individuals.

III. EMPIRICAL SPECIFICATION

The solution to (4) yields a system of demand functions, whose forms are probabilities that the alternatives are chosen given that an individual experiences an accident or illness. The demand function for a given alternative is found by calculating the probability that this particular alternative yields the highest utility amongst all the alternatives. The functional form of the demand functions depends on the functional form of the utility function conditional upon choosing a particular provider and the distribution of the stochastic variables.

A. The Conditional Utility Function

It is customary to begin by considering a linear functional form for the conditional utility function in (1). Substitution of (3) into a linear utility function yields

$$U_j = \alpha_1 H_j + \alpha_2 (Y - P_j) + \alpha_3 T_j + \varepsilon_j \quad (5)$$

where ε_j is a random taste shock that is uncorrelated across alternatives. Notice that $\alpha_2 Y$ enters each alternative's utility function, implying that the influence of income on utility does not vary by alternative. Since only differences in utility matter, a linear utility function imposes the restriction that income has no effect on the choice of provider and that the marginal rate of substitution is constant. Therefore, this specification is inconsistent with health being a normal good.

A common method of trying to relax this restriction is to allow the coefficient on consumption to vary by alternative. 6/ That specification violates the maximization of a stable utility function. It asserts that, holding income, prices, and health constant, the marginal rate of substitution varies by alternative.

A parsimonious parameterization that does not place second order restrictions on the marginal rate of substitution, does not violate the maximization of a stable utility function, and is linear in parameters, is the semi-translog, where health and access costs enter in log form and consumption enters in both log and log squared form. 7/ Substitution of (2) and (3) into a semi-translog conditional utility function yields

$$U_j = \ln H_0 + \ln Q_j + \alpha_1 \ln(Y - P_j) + \alpha_2 \ln(Y - P_j)\ln(Y - P_j) + \alpha_3 \ln T_j + \varepsilon_j \quad (6)$$

The quadratic term is necessary so that the specification does <u>not</u> impose normality and a diminishing marginal rate of substitution, but rather allows us to test for them.

B. Quality

In equation (6) neither $\ln H_0$ nor $\ln Q_j$ are observed. Since $\ln H_0$ appears in the utility function for all the choices and its value does not vary by alternative, it does not influence which alternative is preferred, and therefore can be ignored.

A more difficult issue arises because of the unobservability of $\ln Q_j$. To solve this problem we specify a quality (marginal product) function for each provider type. Specifically, let the expected quality from provider j be

$$\ln Q_j = \beta_{0j} + \beta_{1j}X + \beta_{2j}Z_j + \tau_j \ , \ (7)$$

where X is a vector of the individual's characteristics (i.e. measures of health status, severity of illness and education), Z_j is a vector of characteristics of provider j, and τ_j is a random shock. The error term τ_j represents unobserved individual characteristics, such as severity and complexity of illness, that may affect the providers' marginal productivities relative to self-care. Recall that quality is normalized relative to the self-care alternative, implying that $\ln Q_0 = 0$. The error term τ_j may be correlated across the non-self-care alternatives.

The reduced form conditional utility function for alternative j is found by substituting (7) into (6). Specifically, for alternatives j=1,...,J,

$$U_j = V_j + \varepsilon_j + \tau_j \ , \ (8)$$

where

$$V_j = \beta_{0j} + \beta_{1j}X + \beta_{2j}Z_j + \alpha_1 \ln(Y - P_j) + \alpha_2 \ln(Y - P_j)\ln(Y - P_j) + \alpha_3 \ln T_j .$$

Note that the intercept and coefficients on the quality terms vary by alternative as do the values of consumption and access costs (but not their coefficients). Since $\ln Q_0 = 0$, $T_0 = 0$, and $P_0 = 0$, the reduced form conditional utility function for the self-care alternative becomes

$$U_0 = \alpha_1 \ln Y + \alpha_2 \ln Y \ln Y + \varepsilon_0 .$$

Note further that τ_0 does not exist as quality is normalized relative to the self-care alternative.

C. The Budget Constraint

Specification of the budget constraint requires determining the relevant budgeting period. Since the health care decision is discrete and made irregularly, consumers may be willing to borrow against future income. If capital markets are perfect and individuals (or families) can borrow without restriction, the relevant income constraint is the present value of income, or wealth. The other extreme assumption is that no resources outside each income period can be used. The actual period may be somewhere in between.

We let the data determine the appropriate budgeting period. Define y as permanent monthly income and r as the period discount rate, then the constraining income in (4) is ky, where the parameter k is a function of the length of the budgeting period and r. If budgeting is restricted to one period, then k is equal to 1. If the budgeting period is infinity (i.e. there is perfect borrowing and lending), then k is equal to 1/r.

The addition of k implies (8) is no longer linear in parameters. We linearize (8) using an approximation to the log of consumption. The log of consumption can be expressed as

$$\ln(ky - P_j) = \ln(1 - P_j/ky). \quad (9)$$

Since P_j/ky, the budget share of alternative j, is expected to be small, the second term in (9) can be approximated by $-P_j/ky$, which allows us to rewrite the log consumption and log consumption squared terms in (8) as

$$\alpha_1 \ln(ky) + \alpha_2 \ln(ky)\ln(ky) - \left[(\alpha_1 + 2\alpha_2 \ln k)/k\right](P_j/y) + (\alpha_2/k^2)(P_j/y)^2 - (2\alpha_2/k)(P_j/y)\ln y. \quad (10)$$

Notice that the first two terms in (10) are the same across all alternatives, including self-care. Since only differences in utility across alternatives matter, these terms have no effect on provider choice, and therefore, can be left out. Further, when k equals one, (10) reduces to

$$-\alpha_1(P_j/y) + \alpha_2(P_j/y)\left[P_j/y - 2\ln y\right]. \quad (11)$$

Since both (10) and (11) are linear in parameters, they provide us with an easy likelihood ratio test for k equal to one.

D. The Demand Functions and Welfare

The demand function for an alternative is the probability that its utility is greater than from any other alternatives. McFadden (1981) shows that, given reasonable distributional assumptions on ε_j and τ_j, these demands take on a nested multinomial logit (NMNL) form, where it is first decided whether to seek care, and then conditional on seeking care deciding from which provider to seek care. The probability that provider j is chosen is

$$\Pi_j = \frac{\exp[\sigma \ln(\sum_{j=1}^{J} \exp(V_j))]}{\exp(V_0) + \exp[\sigma \ln(\sum_{j=1}^{J} \exp(V_j))]} \, \frac{\exp(V_j)}{(\sum_{j=1}^{J} \exp(V_j))} .$$

and the probability of self-care is

$$\Pi_j = \frac{\exp(V_0)}{\exp(V_0) + \exp[\sigma \ln(\sum_{j=1}^{J} \exp\,(V_j))]}$$

where the V_j's are given by (8) with (10) substituted for the log consumption terms. Also the $\alpha_1 \ln(ky)$ and $\alpha \ln(ky)\ln(ky)$ are excluded as they do not vary by alternative, which implies that $V_0 = 0$. The parameter σ is one minus the correlation of the j=1,...,J utilities introduced by the τ_j's.

McFadden also shows that NMNL reduces to a multinomial logit (MNL) when σ is unity. The NMNL is more general than MNL in that it allows correlation between the utilities that share common attributes, and therefore does not suffer from the independence of irrelevant alternatives assumption.

The estimated demand functions can be used to project the impact of user fees on demand (and revenues), and the number of people who do not seek health care as a result of user fees. These demand functions also form the basis of our computation of the welfare costs of user fees, where the welfare costs are measured by compensating variations. 8/ For example, consider changing the vector of provider prices from P^1 to P^2. Following Small and Rosen (1981), in the case of a nested multinomial logit, the amount of income the individual must be given to make him as well off at P^2 as at P^1 is

$$\Delta e = (1/\lambda)\{\ln[\exp(V_0^1) + (\textstyle\sum_{j=1}^{J} \exp(V_j^1))^{\sigma}] - \ln[\exp(V_0^2) + (\textstyle\sum_{j=1}^{J} \exp(V_j^2))^{\sigma}]\} \quad (12)$$

where V_j^1 and V_j^2 are evaluated at P^1 and P^2, respectively, and λ is the marginal utility of income. 9/ The compensating variation for nonprice changes (such as travel time) can be similarly calculated.

IV. DATA AND INSTITUTIONAL ENVIRONMENT

The empirical work utilizes data from a 1984 Peruvian household survey, the Encuesta Nacional de Nutricion y Salud (ENNSA). The survey contains a rich set of socio-economic data, as well as morbidity and health care utilization information for a two-week recall. Since this study analyzes contingent health care demand, we restricted our sample to those persons who reported having symptoms or an accident. The sample was taken from individuals living in the urban Sierra and Lima regions. Rural regions were excluded because reliable income data do not exist for them. A sample of 3412 individuals age 16 and above is the basis for this work. Descriptive statistics are presented in table 1.

Peru has a mix of public and private health care. The major provider of public health care is the Ministry of Health, which operates hospitals and clinics. The next largest provider of public health care is the Instituto Peruano de Seguridad Social (Social Security). It operates hospitals for its members, which are not available to non-members. In the analysis, Social Security hospitals are not viewed as a separate alternative, but rather are included in the public hospital alternative. A dummy variable indicating whether the individual was a Social Security member is included in the hospital equation to account for quality differences. The dominant private health care providers are physicians. Other types of private providers, such as traditional healters, and pharmacists were not numerically important, and were merged with the no consultation group to form our "self-care" alternative. The four alternatives are: (1) self-care; (2) public hospital; (3) public clinic; and (4) private doctor.

The arguments of the quality (marginal product) function are the initial state of health, the type of illness, human capital, and provider characteristics. Measures of health status prior to treatment are age and type of illness, which is measured by a set of dummy variables indicating whether the individual's medical problem was an accident or acute illness, digestive illness, respiratory illness, or other illness. The other illness dummy variable was excluded. The quality of providers is thought to vary by location. Hence, a set of regional dummy variables indicating if the individual lives in central Lima, the north and south cones of Lima, and the north, south, and central regions of the Sierra are included. The central Sierra dummy variable was excluded. In addition, the individual's education was included as a measure of human capital.

Income was measured as total family income in the month prior to the survey. Family income is the relevant concept here because family members are not provided or denied health care on the basis of their labor force statuses. This measure reduces the sensitivity of income to the illness of any particular family member.

Since income does not vary by alternative, we need variation in prices across alternatives to identify and estimate the coefficients on the log consumption and log consumption squared terms. In a discrete choice framework, identification requires variation across alternatives. Although variation across individuals is not necessary, it is desirable as it improves the estimation precision. In our data the public hospital and clinic prices do not vary by individual, but there is substantial cross-individual variation in private doctor prices as the data covers many different regions, were collected over a nine month period in which relative prices changed substantially.

Measuring prices posed a difficult problem. The model requires prices for each alternative, but these were not directly available. The ENNSA only collected price information for the provider from which the individual received care. For those who sought care, price data were only available for the alternative they chose, and for individuals who did not seek care there is no information.

The measurement problem was easily solved for hospitals and clinics, since they charged a user fee of 1,000 to 2,000 soles. In our sample, about 35 percent of hospital and clinic users reported paying nothing, about 50 percent reported paying 1,000 soles, and almost all the rest reported 2,000 soles. About half of the reported zero fees are from Social Security hospitals, which do not charge their members for services. The other half are probably a result of failure to collect the fees. Since these prices are minuscule relative to monthly family income (see table 1), we assumed individuals expected to pay 1,000 soles at Ministry of Health hospitals and clinics.

For private doctor prices, we used the available information to estimate hedonic price equations, and then imputed prices for all individuals. The equation specified price to be a function of age, illness, and market structure variables such as population and availability of health care services. Income was not used in order to avoid attributing higher prices to higher income individuals who may have purchased higher quality care. An additional problem was selectivity bias. The observed distribution of prices paid will not be representative of the *ex ante* distribution of prices because individuals are more likely to choose low price alternatives. We corrected for this selectivity bias by following an instrumental variables procedure used in Dubin and McFadden (1984). [10/]

Finally, we measure nonmonetary access cost by travel time to the provider. The travel time data suffer from the same problems as the price data. In addition, travel time information was collected in discrete categories. Binary logit hedonic travel time equations (with selectivity bias correction) were used to estimate the probability of traveling more than an hour.

V. RESULTS

The parameters of a MNL and a NMNL were estimated by maximum likelihood. The NMNL nested the choice of provider within the choice of whether to seek care at all. The hypothesis that the NMNL is not different from the MNL was accepted at the .05 level, and the hypothesis that k equals unity was also accepted at the .05 level. 11/ The estimated coefficients and associated t-statistics for the MNL with k equal to one are presented in table 2.

The coefficients on log consumption and log consumption squared are significant at the .1 and .01 levels, respectively. Price and income therefore play important roles in the demand for medical care. Since price and income enter in a highly nonlinear form it is difficult to assess their influence on demand just from looking at the coefficient values. For this reason, arc price elasticities for clinic, hospital and private doctor services were computed by sample income quintile and are presented in table 3. The price elasticities are negative over all prices and income groups, and demand is more elastic at lower incomes and at higher prices. The magnitude of the prices elasticities varies greatly by income. In the highest income quintile, demand appears to be completely inelastic, while demand in the lowest income quintile is much more sensitive to price.

We have assumed that income is exogenous. If, in fact, income is endogenous, there is a possibility of simultaneity bias. The bias is likely to have a downward impact on the estimated price and income effects, making them closer to zero. The effect we are interested in measuring is the causal impact of changes in income on health care demand. If health is a normal good, then that effect is positive. The simultaneity bias arises because an accident or illness may reduce income. The more severe and complex the illness or accident the greater the reduction in income. However, the more severely ill have greater medical need and are therefore more likely to seek medical care. This implies that the observed relation between income and demand will likely be biased towards zero. Since price enters our model as a reduction in consumption (Y - P), its effect is also likely to be biased towards zero. Therefore, our estimated price elasticities should be lower bounds on the true elasticities.

The coefficient on the probability of traveling more than an hour is negative and estimated with precision. This implies that increases in nonmonetary access costs reduce demand.

The estimated quality parameters are consistent with our expectations. The coefficients on age are positive and significant in the hospital and private doctor equations, and negative in the clinic equation. Hence, older individuals perceive private doctor and hospital care to be of higher quality than self-care and clinic care, and self-care to be of higher quality than clinic care. The coefficients on education are positive and significant in the private doctor and hospital equations, and negative and significant in the clinic equation. The coefficient estimates imply that education increases the expected productivity of private doctor care and hospital care relative to self-care, and reduces the expected productivity of clinic care relative to self-care.

The coefficients on the acute illness (emergencies) imply that hospitals and clinics have a comparative advantage in treating these problems over private doctor or self-care. Individuals with respiratory illnesses believe that they have a comparative advantage in treating themselves. Finally, Social Security hospitals are perceived to provide higher quality than Ministry of Health hospitals, and there is perceived quality variation by region.

VI. USER FEE SIMULATIONS

In this section we use the estimated demand functions to simulate the effects of user fees. A uniform fee is imposed at public facilities (hospitals and clinics). We consider two levels of fees, 10 and 20 thousand soles. These are realistic fee levels; the average fee for a visit to a private doctor was about 20 thousand soles. Monthly demands, revenues, and compensating variations are calculated by summing the individual estimates over the sample and then extrapolating to obtain population projections. Revenues are calculated in April 1984 soles. The base for the extrapolation is the product of the regional population and the overall regional probability of having an illness. Two private markets scenarios are considered: (1) where private doctors do not adjust their prices in response to the changes in public user fees, and (2) where private doctors adjust their prices by the same amount. Further, these scenarios are analyzed under the assumption (1) that the resulting revenues are not reinvested in the health care system, and (2) that the revenues are used to reduce nonmonetary access costs.

A. User Fees Without Reinvestment

Columns 3, 4, and 5 of table 4 report the results of the aggregate user fee simulations under both scenarios. They report the cumulative percentage change in total demand, the increase in public (hospital plus clinic) revenues and the welfare loss due to the user fee increase. [12/] The results show that the imposition of moderate user fees can generate substantial public revenues with small reductions in the total demand for health care, but, of course, with even larger losses in consumers' welfare. Under scenario (1), for example, a user fee of 10 thousand soles generates approximately an additional 6,386 million soles per month in public revenues accompanied by a 7.5 percent reduction in demand and a fall of 7,123 million soles in consumers' welfare. Under scenario (2), that fee generates approximately 6,516 million soles with a 12.5 percent reduction in demand and a fall of 12,460 million soles in consumers' welfare.

Even though the aggregate change in total demand appears to be modest, the effects on the lower income groups are quite large and substantially higher than in the upper income ranges. This is demonstrated in table 5 which shows the percentage change in total demand accounted for by each income quintile, and the welfare loss as a fraction of income for each income quintile. On average, the lowest income quintile accounts for about 40 percent of the total decrease in the quantity of health care demand, while the highest income quintile accounts for only about 5 percent. Not only is the reduction in total demand concentrated in the lowest income groups, but the greatest welfare loss (relative to income) is also borne by them. The simulations show that the lowest income quintile suffers a reduction of welfare of between 3 and 11 percent of income, whereas the highest income groups loses less than one half of one percent.

B. User Fees With Reinvestment

In this set of experiments we assume the government uses the revenues to reduce nonmonetary access costs. In our model nonmonetary access costs are measured by travel time. This simulation assumes that the revenues are used to reduce everyone's travel time to a public clinic and hospital to within one hour or less (i.e. to reduce the probability of traveling more than one hour to a public facility to zero). This is a fairly egalitarian change because our data show that the median travel time probabilities are similar across all income groups.

Columns 6, 7, and 8 of table 4 report the aggregate results for the user fee experiment with reinvestment. Under both scenarios, a user fee of 10 thousand soles and a reduction of travel time to less than an hour increases total consumers' welfare, but a user fee of 20 thousand soles reduces consumers' welfare. Therefore, at a user fee somewhere between 10 and 20 thousand soles, consumers in the aggregate are indifferent between the current (1984) user fees and the higher user fees with easier access. The missing component of this comparison is whether the revenues generated by this user fee would be sufficient to cover the costs of building and operating the additional facilities necessary to reduce travel time.

Even if revenues were sufficient, such a policy would redistribute welfare from poorer to richer. This is demonstrated in table 6 which presents the percent change in total demand within each income quintile, and consumers' welfare loss as a fraction of income. An increase in user fees with reinvestment would result in a substantial decrease in demand by the poor and a slight increase in demand by the rich. In addition there would be a relatively large welfare reduction for the poor and a slight rise in welfare for the rich.

VII. SUMMARY AND CONCLUSIONS

We have derived a discrete choice model of the demand for medical care from a theoretical model that implies a natural interrelation between price and income. We show that, in the context of a discrete choice model, if health is a normal good, then the price elasticity of the demand for health care must decline as income rises. This implies that the models in previous discrete choice studies that restrict the price effect to be independent of income are misspecified.

We estimated this model using data from a 1984 Peruvian survey, and a parsimonious flexible function form. Unlike previous studies, we find that price plays a significant role in the demand for health care, and that demand becomes more elastic as income falls, implying that user fees would reduce the access to care for the poor proportionally more than for the rich. Our simulations show that user fees can generate substantial revenues, but are accompanied by substantial reductions in aggregate consumer welfare, with the burden of the loss on the poor. These results demonstrate that user fees would be regressive both in terms of access and welfare.

The simulations indicate that the welfare loss for some people having to travel more than an hour to a public health care facility is roughly equal to the expected welfare loss from moderate user fees, and the first loss is fairly evenly distributed across income groups. Hence, if the government imposed moderate user fees and used the revenues to solve this access problem, there would be little if any aggregate welfare loss, but there would be a redistribution of welfare from poor to rich. This result is what one would expect in an urban environment where services are fairly evenly distributed, and may not be applicable to rural areas.

We have found that the introduction of user fees in Peru has the potential for raising significant revenues for cost recovery by shifting the financial burden (and commensurate welfare loss) of the health care system from taxpayers to users. We also show that user fees are regressive both in terms of access and welfare. In essence, the health care financing dilemma for developing nations is that the improvement in allocative efficiency and cost recovery from user fees are accompanied by a redistribution of welfare from poorer to richer. A natural solution to this dilemma is to introduce user fee schedules that increase with ability to pay. This type of price discrimination may generate substantial revenues with minimum welfare loss, if administrative costs are contained.

FOOTNOTES

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1/ See de Ferranti (1985) for a discussion of health care pricing methods in developing countries.

2/ Recently, the pros and cons of such proposals have been discussed in de Ferranti (1985), and Jimenez (1986).

3/ Studies of the demand for health care in developing countries include Akin et. al. (1985 and 1986), Birdsall and Chuhan (1986), Heller (1983), and Mwabu (1987).

4/ The feasibility condition requires income to be at least as large as the price of the alternative. The constraining level of income depends on the length of time over which individuals are able to budget. For example, if capital markets are perfect, the budget period is the individual's lifetime and the constraining income the present value of lifetime income. On the other hand, if there are cash constraints, the budgeting period could be as short as the interval in which the individual is paid. In section III.C, we propose a procedure which parameterizes the length of the budgeting period and allows it to be estimated.

5/ If, in fact, income is endogenous, there is a possibility of simultaneity bias. The simultaneity bias arises because an accident or illness may reduce income. We argue in section V that the bias is likely to have a downward impact on the estimated price and income effects, making them closer to zero. Hence, our estimated price elasticities should be lower bounds on the true elasticities.

6/ For example see Akin et. al. (1985 and 1986), Mwabu (1986), and Birdsall and Chuhan (1986).

7/ An obvious extension to the semi-translog is to include interactions and squared terms for health and nonmonetary cost terms. The problem with this is that the health terms, as will be discussed in a moment, will be a function of variables whose coefficients necessarily vary by alternative. Hence, this extension would require a substantially larger parameter space. Since the major objective of this study is to analyze price elasticities, we require the most flexibility in the parameterization of the consumption term. In addition, this specification would violate the necessary conditions for the model to be consistent with utility maximization specified in McFadden (1981). This point is taken up further in footnote 9.

8/ See Deaton and Muellbauer (1980) for discussion of compensating variation and other welfare measures.

9/ In order for (12) to be exact, the marginal utility of income, λ, must be independent of alternative specific characteristics and price. See McFadden (1981) and Small and Rosen (1981) for more discussion on this point. Although λ is independent of quality, it is not independent of price. Specifically

$$\lambda = (\alpha_1 + \alpha_2 \ln(Y - P))/(Y - P) ,$$

and

$$\partial\lambda/\partial P = (2\alpha_2(\ln(Y - P) - 1) - \alpha_1)/(Y - P)^2 .$$

In most cases this term is likely to be small relative to λ, as the denominator is approximately income squared. Hence, λ is likely to be approximately constant across small differences in price. If indeed $\partial\lambda/\partial P$ is small, then each individual's average marginal utility of income over his/her alternatives is a good approximation of λ. Since this approximation is calculated for each individual, λ will vary greatly across individuals as there is substantial variation in income.

10/ A full description of the hedonic price and travel time methodologies and resulting estimates is provided in the Appendix.

11/ The estimated σ was 1.02 with a standard error of 0.86. The test statistic for the hypothesis that σ equals unity is 0.03 and is distributed student t. The critical value at the 0.05 level is 1.96. The test statistic for the null hypothesis that k=1 is 1.06 and is distributed $X^2(1)$. The corresponding critical value at the 0.05 level is 3.84. Our linearization of the log consumption term biases the estimate of k towards zero. However, the observed bias is minuscule when evaluated at the mean of the data.

12/ As discussed in footnote 9, the marginal utility of income, λ, is not constant across alternatives. Each individual's average over the three alternatives is a good approximation if the variation in λ across alternatives is small. In our simulations, the largest price difference across alternatives is 19 thousand soles. At the mean income level with a price of 1 thousand soles λ is 0.0111, and at a price of 20 thousand soles λ is 0.0115; a difference of 0.0004. This difference declines with income, implying that the goodness of the approximation increases with income. The approximation is poor only at very low levels of income.

APPENDIX

The hedonic private doctor price equation specifies the price of a single visit to be a function of the type of illness, age of the individual, and characteristics of the market. The market variables include the number of doctors, the number of hospital beds, the number of clinics, and the population of the district in which the individual lives. We correct for sample selection bias using a methodology derived in Dubin and McFadden (1982). This requires the estimation of a reduced form multinomial logit model of provider choice, from which a set of Dubin-McFadden selection correction terms are constructed (predicted) for each individual. The predicted correction terms are included as regressors in the hedonic price regression. Separate models are estimated for Lima and the Sierra. The market variables are not included in the Lima regression as there is no variation. The estimated coefficients and t-statistics are presented in table A.

The hedonic travel time equations for private doctors, hospitals, and clinics specify the time it takes to travel to a provider to be a function of the market variables, the location of the individual, a dummy variable indicating whether the main road in the district is paved, and the Dubin-McFadden selection correction terms. An additional problem arises because we only observe if the individual traveled more or less than an hour. The hedonic travel time equations were estimated as binary logits. Separate Lima and Sierra models were estimated for private doctors and hospitals, and, due to small sample sizes, a single pooled model was estimated for clinics. The estimated coefficients and t-statistics are also presented in table A.

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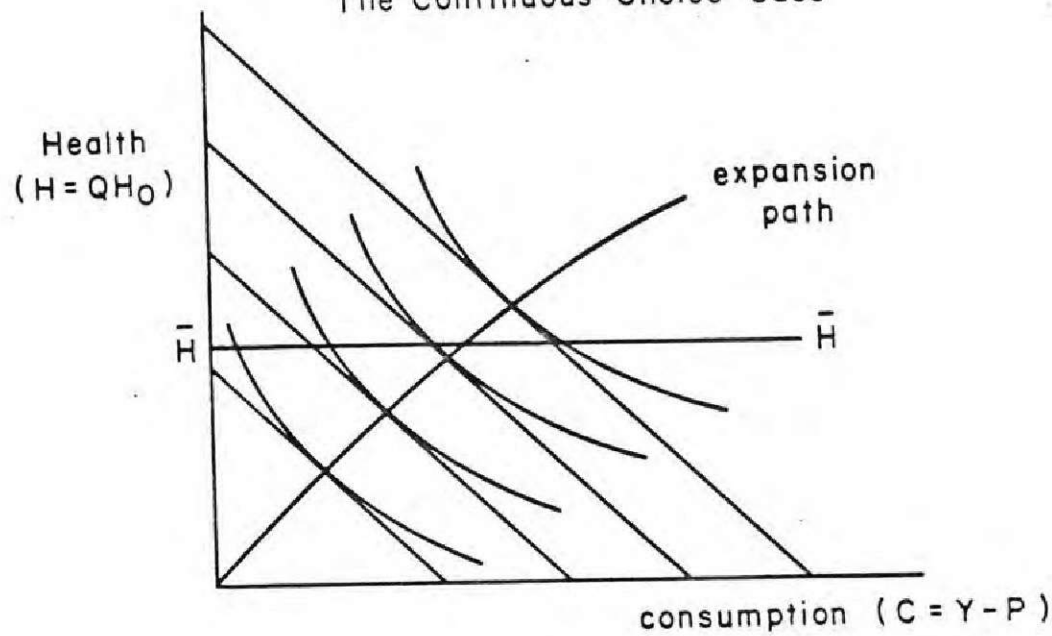
The Continuous Choice Case



The Discrete Choice Case

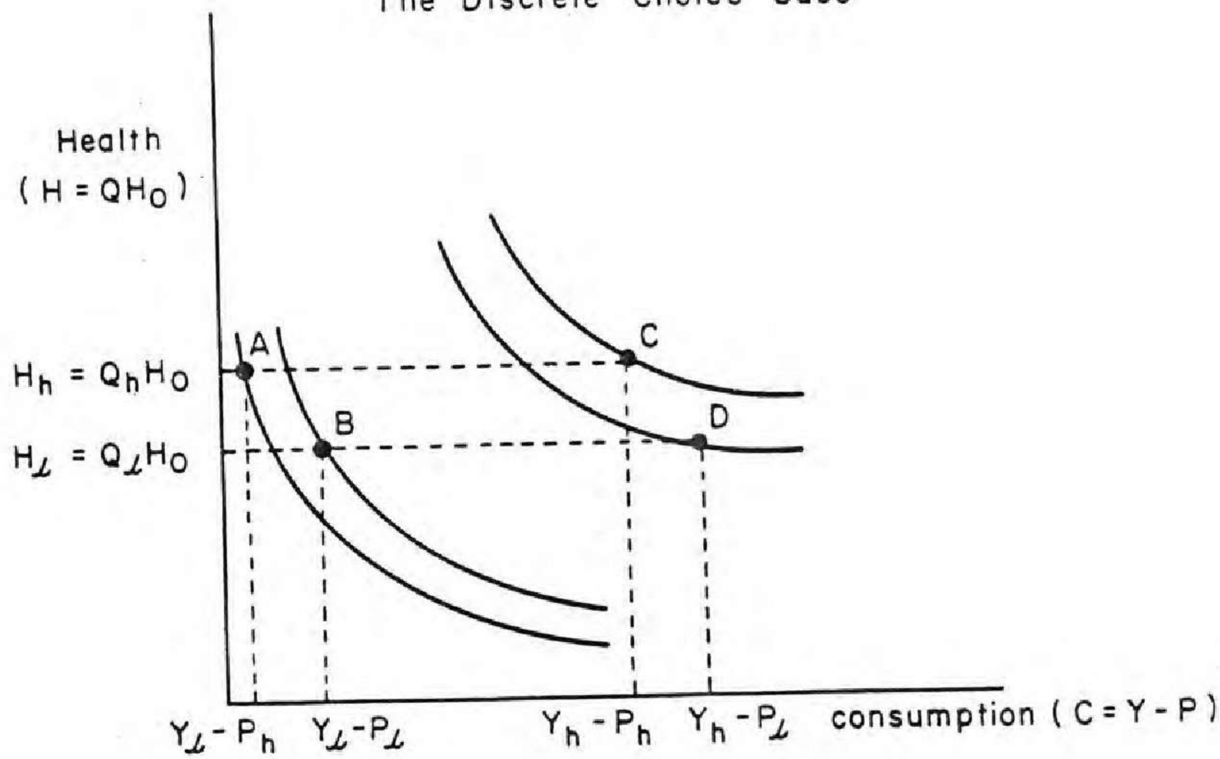


Table 1
Summary Statistics (N=3412)

Variable	Mean	Standard Deviation
Went to a public clinic (past 14 days)*	0.05	(0.22)
Went to a public hospital (past 14 days)*	0.11	(0.32)
Went to a private doctor (past 14 days)*	0.09	(0.29)
Age	39.18	(17.57)
Years of Education	7.73	(4.82)
Social Security*	0.15	(0.36)
Acute illness (past 14 days)*	0.05	(0.22)
Respiratory illness (past 14 days)*	0.15	(0.35)
Digestive illness (past 14 days)*	0.45	(0.50)
Resident of Lima*	0.37	(0.48)
Resident of South Cone*	0.10	(0.30)
Resident of North Cone*	0.22	(0.41)
Resident of South Sierra*	0.08	(0.27)
Resident of North Sierra*	0.15	(0.36)
Price of visit to private doctor**	19.01	(7.54)
Monthly income**	426.45	(1070.39)
Prob. travel time to clinic > 1 hour	0.01	(0.03)
Prob. travel time to hospital > 1 hour	0.13	(0.26)
Prob. travel time to private doctor > 1 hour	0.07	(0.14)

* Dummy variables (= 1 if answer is yes, = 0 otherwise).
** In 1,000's of April, 1984 soles.

Table 2
Multinomial Logit Estimated Coefficients and t-Statistics

Variable	Hospital	Clinic	Private Doctor
Log Consumption*	-2.77 (1.81)	-2.77 (1.81)	-2.77 (1.81)
Log Consumption Squared*	0.62 (2.40)	0.62 (2.40)	0.62 (2.40)
Travel Time*	-2.05 (3.44)	-2.05 (3.44)	-2.05 (3.44)
Age	0.01 (4.35)	-0.01 (1.67)	0.01 (2.53)
Education	0.04 (2.77)	-0.05 (2.10)	0.05 (3.91)
Acute Illness	0.78 (3.87)	0.83 (2.77)	-0.29 (0.90)
Respiratory Illness	-0.64 (5.19)	-0.37 (1.49)	-0.74 (5.42)
Digestive Illness	0.09 (0.59)	0.32 (1.49)	-0.17 (0.95)
Lima	0.22 (1.11)	1.21 (2.71)	-0.10 (0.46)
South Cone	0.53 (1.62)	1.69 (3.58)	0.02 (0.08)
North Cone	0.36 (1.50)	1.31 (2.91)	-0.45 (1.94)
South Sierra	0.63 (2.33)	0.78 (1.51)	-0.05 (0.18)
North Sierra	-0.07 (0.26)	1.19 (2.52)	-0.00 (0.01)
Social Security	0.77 (5.55)	-	-
Constant	-2.72 (8.70)	-3.12 (5.71)	-1.99 (6.32)

* The coefficients are restricted to be equal across equations.

Table 3
Arc Price Elasticities by Income Quintile

User Fee Change*		Quintile 1 (lowest)	Quintile 2	Quintile 3	Quintile 4	Quintile 5 (highest)
Clinic	0-10	-0.17	-0.12	-0.09	-0.06	-0.03
	10-20	-0.62	-0.42	-0.23	-0.15	-0.09
	20-30	-1.43	-0.58	-0.38	-0.26	-0.14
Hospital	0-10	-0.15	-0.12	-0.08	-0.05	-0.03
	10-20	-0.57	-0.34	-0.23	-0.15	-0.09
	20-30	-1.52	-0.56	-0.39	-0.26	-0.13
Private Doctor	0-10	-0.17	-0.12	-0.07	-0.06	-0.03
	10-20	-0.53	-0.35	-0.21	-0.14	-0.08
	20-30	-1.36	-0.60	-0.35	-0.25	-0.12

* Reported in thousands of April, 1984 soles.

Table 4
User Fee Simulations - Aggregate Results

Scenario	No Revenue Reinvestment				With Revenue Reinvestment		
	User* Fee Change	Cum % Δ in Total Demand	Public** Revenue Increase	Welfare** Losses	Cum % Δ in Total Demand	Public** Revenue Increase	Welfare** Losses
No Private Doctor	1-10	-7.5	6,386	7,123	+0.5	7,006	-7,354
Price Response	1-20	-14.3	11,306	13,872	-7.3	13,686	569
Equal Pri. Doctor	1-10	-12.5	6,516	12,460	-4.4	7,756	-2,160
Price Response	1-20	-23.9	11,906	23,957	-16.6	14,126	10,407

* Reported in thousands of April, 1984 soles.
** Reported in millions of April, 1984 soles.

Table 5
User Fee Simulations - Distributional Results (No Revenue Reinvestment)
Percentage Change in Total Demand Accounted for by Each Income Quintile and
Consumers' Welfare Loss as a Percentage of Income by Income Quintile

Scenario	User* Fee Change	Quintile 1 (lowest) A*	B**	Quintile 2 A	B	Quintile 3 A	B	Quintile 4 A	B	Quintile 5 (highest) A	B
No. Pri. Doctor	1-10	38.4	3.0	29.3	1.2	16.2	0.6	11.1	0.4	5.0	0.1
Price Response	1-20	37.6	6.2	26.5	2.3	17.5	1.2	12.1	0.7	6.3	0.2
Equal Pri. Doctor	1-10	39.2	6.1	25.3	1.9	16.9	1.0	12.0	0.6	6.6	0.2
Price Response	1-20	38.1	11.2	24.7	3.5	17.2	2.0	13.1	1.3	6.9	0.5

* A = Percentage Change in Total Demand Accounted for by Each Quintile.
** B = Consumers' Welfare Loss as a Percentage of Income by Quintile.

Table 6
User Fee Simulations - Distributional Results (With Revenue Reinvestment)
Percentage Change in Demand by Income Quintile and
Consumers' Welfare Loss as a Percentage of Income by Income Quintile

Scenario	User* Fee Change	Quintile 1 (lowest) A*	B**	Quintile 2 A	B	Quintile 3 A	B	Quintile 4 A	B	Quintile 5 (highest) A	B
No Pri. Doctor	1-10	-7.5	1.7	-2.9	0.4	2.3	-0.1	3.8	-0.3	6.1	-0.6
Price Response	1-20	-23.8	4.9	-14.1	1.7	-6.2	0.6	-0.8	0.1	3.8	-0.4
Equal Pri. Doctor	1-10	-18.7	4.5	-9.4	1.1	-2.8	0.3	1.0	-0.1	4.1	-0.4
Price Response	1-20	-44.8	10.0	-26.0	2.9	-13.8	1.3	-7.1	0.6	1.0	-0.2

* A = Percentage Change in Demand Within Each Quintile.
** B = Consumers' Welfare Loss as a Percentage of Income Within Each Quintile.

Table A
Hedonic Price and Travel Time Repressions

Independent Variable	Private Doctor Price		Private Doctor Travel Time		Hospital Travel Time		Clinic Travel Time
	Lima	Sierra	Lima	Sierra	Lima	Sierra	
Constant	1.99 (3.50)	3.78 (6.51)	2.14 (1.79)	0.71 (0.39)	1.88 (2.28)	0.95 (0.49)	3.29 (2.05)
Age	0.18 (0.94)	0.46 (2.48)	-	-	-	-	-
Acute Illness	0.34 (0.73)	-0.54 (1.06)	-	-	-	-	-
Respiratory Illness	0.12 (1.02)	0.07 (0.50)	-	-	-	-	-
Digestive Illness	-0.07 (0.41)	-0.23 (1.01)	-	-	-	-	-
North Cone of Lima	-0.14 (0.87)	-	0.45 (0.97)	-	-0.34 (1.13)	-	1.99 (1.69)
South Cone of Lima	-0.14 (0.96)	-	-0.64 (1.52)	-	-0.91 (2.46)	-	-1.12 (1.47)
North Sierra	-	-0.72 (2.57)	-	-0.46 (0.72)	-	1.76 (1.31)	-0.33 (0.47)
South Sierra	-	-0.25 (0.60)	-	-0.31 (0.29)	-	1.46 (1.37)	-0.16 (0.47)
# of Doctors in District	-	-0.01 (1.25)	-	0.03 (1.68)	-	-	-
# of Hospital Beds in District	-	-0.00 (3.40)	-	-	0.01 (1.98)	-	-
# of Clinics in District	-	-0.18 (3.66)	-	-	-	-	-
District Population	-	2.42 (1.46)	-	4.72 (2.11)	-	5.13 (2.51)	-
District Pop. Sq'd.	-	-2.72 (2.11)	-	-1.86 (1.45)	-	-2.88 (2.50)	-

Table A
Hedonic Price and Travel Time Repressions
(Continued)

Independent Variable	Private Doctor Price		Private Doctor Travel Time		Hospital Travel Time		Clinic Travel Time
	Lima	Sierra	Lima	Sierra	Lima	Sierra	
Good Road Dummy	-	-	-	1.30 (2.04)	-	0.66 (1.05)	0.86 (1.73)
Hospital Selection Term	-1.51 (1.99)	-0.64 (1.09)	2.25 (1.43)	1.91 (0.74)	-	-	3.80 (1.39)
Clinic Selection Term	2.21 (2.54)	1.99 (2.20)	-1.07 (0.63)	-2.21 (1.01)	-1.41 (1.09)	-5.13 (1.33)	-
Private Doctor Selection Term	-	-	-	-	2.07 (1.22)	-0.75 (0.22)	-4.57 (1.39)
Self-Care Selection Term	-0.62 (1.04)	-0.80 (1.28)	-0.83 (0.57)	0.22 (0.12)	-0.36 (0.24)	5.42 (1.54)	0.88 (0.47)

II Non-Price Rationing for Medical Care; The Case of Cote d'Ivoire

I. Introduction

Many developing countries have created extensive publicly supported health care systems, whose services are typically provided at little or no monetary cost. The rational behind these subsidies is to insure that all income groups have equal access to medical care.[1/] However, in the absence of user fees (access charges), equal access is still not assured. It has been well known since Acton (1975) that indirect access prices, such as travel time, are important determinants of health care choices, and when direct prices are small, these indirect costs become the dominant rationing device. Travel time is expected to be a particularly powerful rationing devise in poor developing countries, where the majority of the population inhabit rural areas and health infrastructures are concentrated in cities. The purpose of this paper is to investigate the impact of travel time on the demand for health care in rural Côte d'Ivoire.

Most of the previous studies on the demand for medical care in developing countries have found little if any impact of prices and travel time on demand. These studies model the demand for health care as a discrete choice amongst alternative providers, with the price effect specified to be independent of income. [2/] This assumption is extremely restrictive, since one would expect the wealthy to be less sensitive to price differences amongst providers than the poor. Gertler, Locay, and Sanderson (1986) show that this specification is inconsistent with stable utility maximization, and that the price elasticity of demand must decline with income for health to be a normal good. They derive a discrete choice specification from a theoretical model that implies a natural interaction between price and income in the demand functions. Their empirical results for Peru show that prices are important determinants of health care demand, and that demand indeed becomes more elastic as income falls.

All of the previous studies specify access costs such as travel time as a non-monetary nuisance parameter in the utility function, implying that their coefficients are interpreted as the marginal disutility of traveling. Acton (1975) points out that the monetary outlays associated with these access costs should enter the budget constraint in the same way as the direct price of medical care. This study extends the specification in Gertler, Locay, and Sanderson (1986) by including access costs directly in the budget constraint as well as a non-monetary nuisance parameter in the utility function.

Previous studies also estimate a Multinomial Logit (MNL) discrete choice model. The MNL suffers from the Independence of Irrelevant Alternatives property which restricts the cross-price elasticities to be equal across alternatives. Instead, we employ a Nested Multinomial Logit (NMNL) specification which allows non-equal cross-price elasticities and has the MNL nested as a special case. Further, we estimate the NMNL by Full Information Maximum Likelihood (FIML) rather than the more popular two-step procedure. Hensher (1986) reports that FIML achieves large efficiency gains over the two-step procedure for NMNL.

The model is estimated using data from the World Bank's Living Standards Measurement Survey of Côte d'Ivoire. Our findings indicate that travel time plays an important role in determining health care utilization both as a price and as a nuisance parameter. The results also show that health care demand amongst poorer individuals is substantially more travel time elastic than amongst richer individuals. Further, specification tests reject the MNL in favor of the NMNL.

The paper is organized as follows. In Section II and III we develop the model and the empirical specification. The data and institutional environment are discussed in Section IV. The results are presented in Sections V and VI. Finally a short summary is provided in Section VII.

II. Behavioral Assumptions

The framework for this discussion is a model in which utility depends on health and the consumption of goods other than medical care. Health is valued both as a consumption good and as an investment in productivity. If an illness or accident is experienced, individuals must decide whether to seek medical care. The benefit from consuming medical care is an improvement in health, and the cost of medical care is a reduction in the consumption of other goods. Individuals have to decide not only whether to seek care, but also what type of care. They are faced with a set of alternative providers, each of which has a different potential impact (efficacy) on their health. This efficacy depends on providers' skills, individuals' characteristics (e.g. medical problems, general health status, and ability to implement the recommended treatment plan), and a random term that captures the notion that the efficacy of medical care is not deterministic. An individual's expectation of this impact can be viewed as the perceived quality of care.

In essence, individuals are faced with a discrete choice decision. A choice must be made between the various provider alternatives, including self-care. Each alternative offers a set package (quality) for a given price, where the price includes both monetary outlays and access costs such as travel and waiting time. Access costs enter the utility maximization problem in both monetary and non-monetary forms. They enter in monetary form via the budget constraint, and in non-monetary form as a nuisance argument of the utility function. For example, the cost of traveling to a provider is a monetary access cost and the disutility from the time spent traveling is a non-monetary access cost. Based on this information, their health status, types of medical problems, and incomes, individuals choose the alternative that yields the greatest utility.

The utility maximization problem is specified as a two stage budgeting process. Utility is assumed to be separable in health and non-medical consumption. Individuals first decide how to divide their budget between health care and other consumption, and then choose the components of their consumption bundles. Since we are only concerned with the first stage, total expenditures on non-medical goods enter the utility function directly.

Formally, let utility conditional on receiving care from provider j, be given by

$$(1) \quad U_j = U(H_j, C_j, T_j),$$

where H_j is expected health status after receiving treatment from provider j, C_j is expenditures on consumption after paying provider j, and T_j is the travel time to provider j.

The health care purchased from provider j is invested in health. The perceived quality (marginal product) of provider j's medical care is the expected improvement in health. Let H_0 be expected health status without professional medical care (i.e. self-treatment). Then, the perceived quality of provider j's care is

$$Q_j = H_j/H_0,$$

which yields an expected health care production function of the form

$$(2) \quad H_j = Q_j H_0,$$

where H_j is proportional to H_0. This production function takes on a rather simple form for the self-care alternative. Since H_j equals H_0, the proportionality factor is unity for the self-care alternative. In effect, this normalizes the health care production function so that the quality of a particular provider's care is measured relative to efficacy of self-care.

Let P^*_j be the total monetary price of provider j's care and Y be income, then the budget constraint is

$$(3) \quad C_j + P^*_j = Y,$$

with $C_j \geqq 0$ required for feasibility. The consumption of medical care is an investment in productivity, which affects income. In rural farming households, this period's work determines next period's income. Hence, this period's income is exogenous to this period's health care decisions.

The total price of medical care includes both the direct payment to the physician and the price of access (e.g. the cost of travel time). Substitution of (3) into (1) for C_j yields the conditional indirect utility function

$$U_j = U(H_j, Y - P^*_j, T_j).$$

Notice that income affects utility through the consumption term, and that the price of medical care is foregone consumption.

Now we are ready to specify the utility maximization problem. Suppose the individual has J+1 feasible alternatives (with the j=0 alternative being self-care). The unconditional utility maximization problem is

(4) $U^* = \max(U_0, U_1, \ldots, U_J)$,

where U^* is the highest utility the individual can attain.

If health is a normal good, then the demand for health increases with income. A necessary condition for normality is that as income rises, the marginal rate of substitution of consumption for health diminishes, holding health constant. This point is demonstrated in figure 1, where the continuous choice case is pictured. As income rises the point of utility maximization moves out from the origin along the expansion path. Holding health constant at $\bar{H}$, we move to the right along the horizontal line as income rises. Thus, as income rises, the $\bar{H}$ line intersects the indifference curves at points of flatter slopes, implying a diminishing marginal rate of substitution.

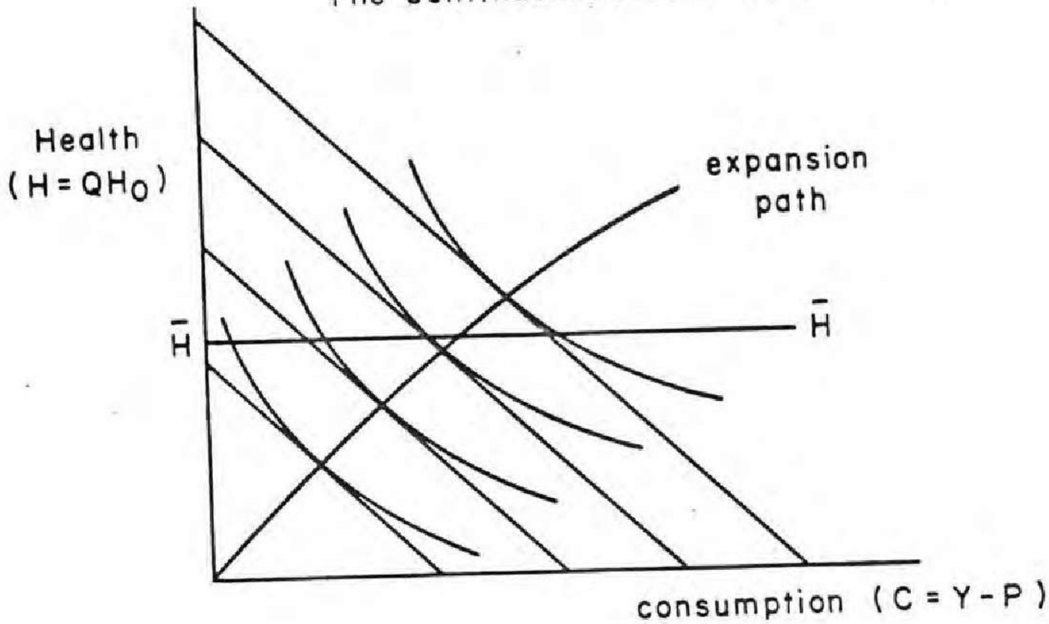
In a discrete choice world, health being a normal good implies that as income rises individuals are more likely to choose the higher price/higher quality options. This demonstrated in figure 2, where the discrete choice case is pictured. In figure 2, there is a choice between a high price/high quality option (Q_h, P_h), and a low quality/low cost option (Q_l, P_l). At a low income level, say Y_1, the choice is between points A and B [i.e. between a gain in health of $(H_h - H_l)$ and a gain in consumption of $(P_h - P_l)$]. At income Y_1, the gain in consumption is preferred to the gain in health and the low cost/low quality option B is chosen. As income rises the marginal rate of substitution of consumption for health falls along both horizontal lines H_h and H_l. Hence, as income rises the marginal utility of health relative to consumption rises. Eventually (at income Y_h in figure 2) the gain in health is preferred to the gain in consumption, and the high quality/high price option C is chosen.

Therefore, in a discrete choice world, if health is a normal good, a rise in income increases the likelihood that individuals purchase higher quality/higher cost alternative. Another way of looking at this is that an increase in price is less likely to dissuade richer individuals from choosing the higher quality/higher cost alternatives. In a probabilistic sense, this implies that richer individuals are less price elastic than poorer individuals.

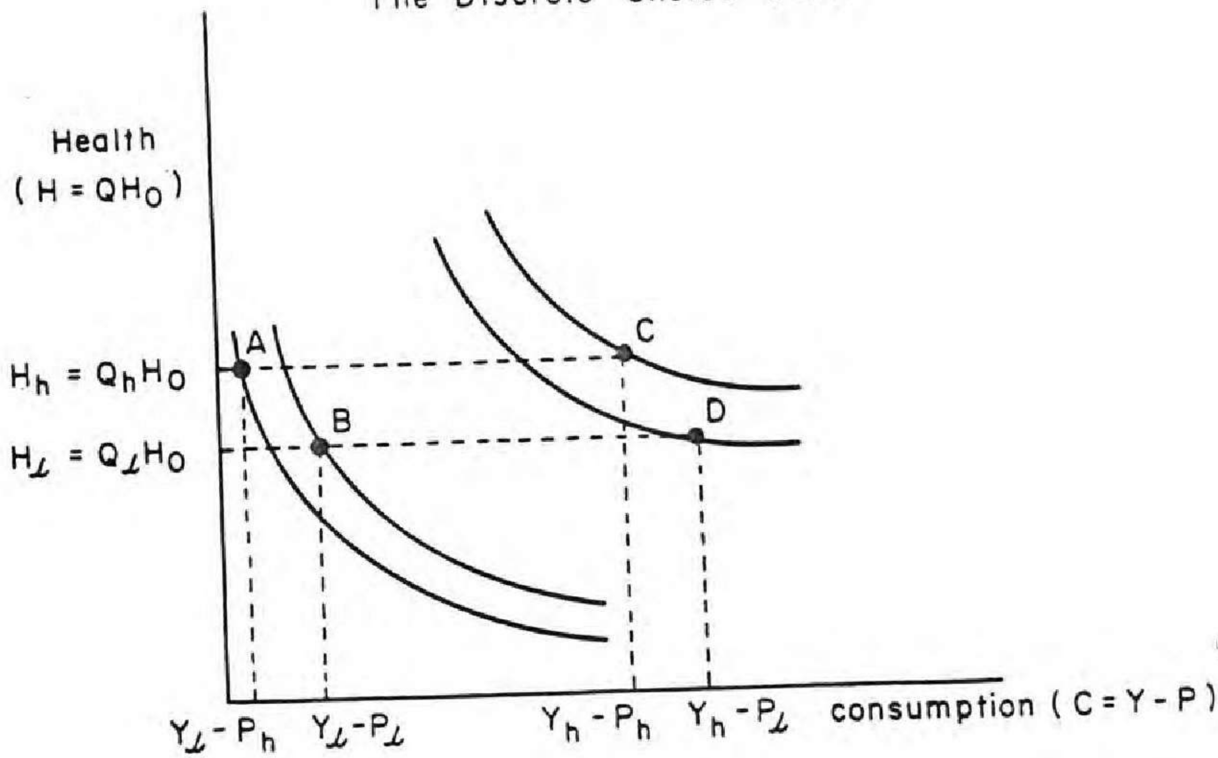
III. Empirical Specification

The solution to (4) yields a system of demand functions, whose forms will be probabilities that the alternatives are chosen. The probability that a particular alternative is chosen equals the probability that this alternative yields the highest utility amongst all the alternatives. The functional form of the demand functions depends on the functional form of the conditional utility function and the distribution of the stochastic variables.

The Continuous Choice Case



The Discrete Choice Case



A. The Conditional Utility Function

As discussed in the previous section, the conditional utility function must allow for a diminishing marginal rate of substitution. Since a linear function imposes a constant marginal rate of substitution, it is rejected. Further, we reject a linear specification with provider specific coefficients on consumption, as that would imply that the marginal rate of substitution varies by alternative for the same values of quality, price and income. A specification that avoids these pitfalls is the Cobb-Douglas utility function.

The arguments of the jth conditional utility function are the expected level of health after receiving care from provider j, consumption of non-medical care goods, and the travel time nuisance parameter. At this point it is convenient to specify utility to be explicitly a function of health as a consumption good and of health as an investment in earnings ability. The return to health as an investment, is its productivity effect on next year's income. Let Y_{2j}, be next year's expected income conditional on the individual having health H_j. Substitution of (2) and (3) into a Cobb-Douglas conditional utility function yields the conditional indirect utility function.

$$(5)\quad U_j = \ell n(H_0) + \ell n(Q_j) + \alpha_1 \ell n(Y - P_j^*) + \alpha_2 \ell n(T_j) + \alpha_3\, \ell n(Y_{2j})$$

In equation (5), $\ell n(H_0)$, $\ell n(Q_j)$ and $\ell n(Y_{2j})$ are not observed. Since $\ell n(H_0)$ appears in the utility function for all the choices and its value does not vary by alternative, it does not influence which alternative is preferred, and therefore can be ignored. To get around the unobservability of $\ell n(Q_j)$, we specify a quality (marginal product) function for each provider type. Specifically, let the expected quality from provider j be

$$(6)\quad \ell n(Q_j) = \beta_{0j} + \beta_{1j}X + \beta_{2j}Z_j + \varepsilon_j,$$

where X is a vector of the individuals' characteristics (e.g. measures of health status, severity of illness, education), Z_j is a vector of characteristics of provider j, and ε_j is a zero mean random disturbance with finite variance.

A similar approach is used to bypass the unobservability of $\ell n(Y_{2j})$. Next period's income is determined from the household production function, which is a function of the levels of inputs (e.g. labor, land, capital, rain, etc.). The marginal productivity of any of the inputs depends on the individual's health. Since health depends on the productivity of the medical care consumed, the parameters of the function vary by alternative. As was done with quality, we normalize the health investment effect relative to the self-care alternative. This involves differencing $\ell n(Y_{2j})$, income in year 2 after provider j is chosen, from $\ell n(Y_{20})$, income in year 2 after the self-care alternative is closer. Let the return in terms of next year's income of provider j's care relative to self-care be given by

$$(7)\quad \ell n\ (Y_{2j}) = \ell n\ (Y_{20}) + \gamma_{0j} + \gamma_{1j}\ \ell n\ (S),$$

where S is the vector of farm inputs.

The reduced form conditional utility function for alternative j is found by substituting (6) and (7) into (5). Specifically, for alternatives j=1,...,J, the conditional utility function is

$$(8)\ U_j = (\beta_{0j} + \gamma_{0j}) + \beta_{1j}X + \beta_{2j}Z_j + \alpha_1 \ln(Y - P_j^*) + \alpha_2 \ln(T_j) + \gamma_{1j} \ln(S_j) + \varepsilon_j$$

Note that the intercept and the coefficients of X, Z and S vary by alternative, as do the values of consumption and access costs (but not their coefficients). The restrictions that H_j equals H_0, that the coefficients of the farm inputs are normalized relative to the self-care alternative, and that P_0 is assumed to be zero imply that the conditional utility function for the self-care alternative reduces to

$$U_0 = \alpha_1 \ln Y + \varepsilon_0.$$

B. The Budget Constraint

The full price of provider j's medical care is

$$(9)\quad P_j^* = P_j + wT_j.$$

where P_j is the direct payment to provider j and w is the opportunity cost of time. Substitution of (9) into the conditional utility function in (8) yields

$$(10)\ U_j = \beta_{0j} + \gamma_{0j} + \beta_{1j} X + \beta_{2j}Z_j + \alpha_1 \ln(Y - P_j - wT_j) + \alpha_2 \ln(T_j) + \gamma_{1j} \ln(S) + \varepsilon_j$$

In order to simplify the estimation we use an approximation to the log of consumption. The log of consumption can be expressed as

$$(11)\quad \ln(Y - P_j - wT_j) = \ln(Y) + \ln\left(1 - (P_j + wT_j)/Y\right)$$

Since $(P_j + wT_j)/Y$, the budget share of alternative j, is expected to be small, the second term in (11) can be approximated by $-[(P_j + wT_j)/Y]$. Substitution into (10) for the log consumption term yields

$$(12)\quad U_j = V_j + \varepsilon_j$$

where

$$(13)\quad V_j = \beta_{0j} + \gamma_{0j} + \beta_{1j}X + \beta_{2j}Z_j + \alpha_1\ln(Y) - \alpha_1[(P_j + wT_j)/Y] + \alpha_2\ln(T_j) + \gamma_{1j}\ln(S)$$

Notice that the $\alpha_1\ln(Y)$ term in (13) is the same across all alternatives, including self-care. Since only differences in utility across alternatives matter, this term has no effect on provider choice, and therefore, can be omitted. Thus, the deterministic portion of the self-care utility function reduces to $V_0 = 0$.

Earnings affect the model in two ways. First, as discussed above, income enters the budget constraint, and second, the wage rate enters via the access cost as the value of time. The access cost to a provider is the product of the individual's wage rate (value of time) and the time spent traveling to see the provider. If health is a normal good, then an increase in income, holding the wage constant, raises the probability that the high quality/high cost alternative is chosen. Alternatively, an increase in the wage rate, holding income constant, is tantamount to a price rise, thus reducing the probability that the provider is chosen.

C. The Demand Functions

The demand function for an alternative is the probability that its utility is greater than from any of the other alternatives. Previous studies have assumed that these demand functions take on a multinomial logit (MNL) form. As discussed in McFadden (1981), the MNL suffers from the Independence of Irrelevant Alternatives assumption. This assumption is equivalent to assuming that the conditional utility functions are uncorrelated across alternatives, and imposes the restriction that the cross-price elasticities are the same across alternatives. A computationally feasible generalization to the MNL is the Nested Multinomial Logit (NMNL), (McFadden, 1981). The NMNL allows correlation across subgroups of alternatives, and therefore, non-constant cross-price elasticities across subgroups. Another advantage of the NMNL is that the MNL is nested within it, providing us with a specification test.

The health care choices in the Côte d'Ivoire data set are hospital, clinic, and self-care. Let us group the hospital and clinic alternatives together, and allow the conditional utility functions to be correlated for these alternatives. In this case, the self-care demand function (i.e. the probability of choosing self-care) is:

$$\Pi_0 = \frac{\exp\ (V_0)}{\exp\ (V_0) + \exp\ (\sigma I)}$$

and the probability of choosing provider j is:

$$\Pi_j = \left(\frac{\exp(\sigma I)}{\exp(V_0) + \exp(\sigma I)}\right) \left(\frac{\exp(V_j)}{\exp(I)}\right),$$

where

$$I = \log\left(\sum_{k=1}^{J} \exp(V_k)\right),$$

and V_j is given in (13). Since $V_0 = 0$, $\exp(V_0 = 1)$. The coefficient σ in the demand equations is one minus the correlation of the hospital and clinic conditional utility functions. When $\sigma = 1$, the NMNL reduces to an MNL.

IV. Data

The data used in this study are drawn from the Ivorian Living Standard Survey (ILSS). This multi-purpose household survey, which aims at measuring many socioeconomic factors relevant to the living standards of Ivorian households, was started in February 1985. 3/ During the first 12 month period, 1588 households were interviewed of which 950 were located in rural areas. Approximately 93 percent of these households are farming households. The other households were deleted from the sample. Detailed information on health-care utilization was obtained from all household members who reported an illness or injury during the four weeks prior to the interview. The ILSS also contains extensive information on many socioeconomic aspects relevant to the demand for medical care.

In addition to household data, the ILSS collected community level information in rural areas. The rural component of the household survey was comprised of 56 sample clusters, which roughly correspond to small villages. However, the community survey was completed in only 52 rural clusters. Relevant to the current study is the data on the availability of various types of health care facilities and community wage rates. Travel time is reported for the nearest available facility of each type (hospital, clinic, maternity center, etc.). When a provider is available in the village, travel time is recorded as zero. In addition, male and female agriculture wage rates were collected for each community.

The final estimation sample is drawn from the pool of adults in 49 clusters or villages, and contains 1030 individuals over the age of 15. Four clusters where excluded either because travel times were not known or because they were obviously misreported. Further, since the study focused on primary health care, visits associated with obstetric care (maternity centers) were excluded from the final sample as well. There were only 19 such cases. In order to focus on primary curative health care, the sample was further restricted to those individuals reporting an illness. Summary statistics of the data are reported in Table 1.

Since there is no private health care in rural Côte d'Ivoire, persons who wish to obtain medical care must choose between government clinics and outpatient wards of government hospitals. Of the 49 villages in the sample, 10 had clinics on the premise. There was no village with a hospital on premise, although in one case a hospital was as close as 6 minutes away. Thirty villages were served by hospitals further away than clinics. In 19 villages, hospital outpatient wards and clinics were equidistant. Maximum travel time (in one direction) was 5 hours for hospitals and only 2 hours for clinics. The travel time access cost is measured as the product of the value of travel time to the nearest provider. The value of time is measured as the prevailing hourly wage rates in each cluster for adults males and females. Total household consumption is used as the household's total income measure.[4/]

The arguments of the quality production function are the health status of the individual, human capital, and provider characteristics. As measures of health status we include age and the number of days the individual was healthy during the past four weeks. The number of healthy days is calculated as 28 minus the number of days the individual reported being restricted from normal activities due to illness over the last four weeks. Human capital is measured in years of schooling. The human capital variable is years of education, but educational attainment is typically low; approximately 84% of the sample reported no schooling.

The inputs to the agricultural production function are hectares of land and available labor measured by the number of prime age adults in the household. Another important productivity factor is the number of children. Children may reduce the adult time available for farm production. Age, sex and education are also likely to affect productivity.

V. Results

The coefficients and associated t-statistics from full information maximum likelihood estimation of the NMNL model are presented in table 3. Overall, the results are consistent with economic theory and common sense. The estimated value of σ is 0.46 and is significantly different from one at the 5% level, implying that the data reject MNL specification. Travel time both as an access cost and as a nuisance parameter, appears to be an important

Table 1: Descriptive Statistics

Variable	Mean	Standard Deviation
Clinic a/	0.24	(0.42)
Hospital a/	0.15	(0.36)
Clinic travel time b/	0.58	(0.65)
Hospital travel time b/	0.93	(0.94)
Income c/	1.43	(1.27)
Hourly wage d/	65.56	(70.10)
Age	44.85	(17.12)
Male	0.46	(0.50)
Years of education	0.87	(2.21)
Healthy days	18.63	(9.93)
Number of adults	5.54	(4.64)
Number of children	5.29	(5.43)
Log (Land)	1.85	(0.84)
Sample Size	1030	

a/ Dummy variable, equal to one if alternative is chosen.

b/ Travel time is reported in hours.

c/ Income is reported in millions of CFA's. The exchange rate in 1985 was approximately 461 CFA's per U.S. dollar.

d/ Wage rate is reported in CFA's.

determinant of provider choice. The coefficient on time as an access cost is negative and significantly different from zero at the 5% level, and the coefficient on time as a nuisance parameter is negative and significant at the 10% level. More discussion about the magnitude of the travel time and income effects is presented in the next section.

The age effect is negative and significant (at the 1% level), and is substantially larger for hospitals than for clinics. There are two immediate explanations. The first is that medical care is less efficacious for older adults than it is for younger adults. For example, medical care has a greater impact on acute problems prevalent among the young than on chronic illnesses prevalent amongst the elderly. This is consistent with our empirical result that the demand for clinic care falls faster with age than the demand for hospital care. For chronic illnesses hospital care is likely to be more efficacious than clinic care. Another explanation follows from a motive to consume medical care as an investment in productivity. Grossman (1972) shows that the lower the marginal productivity of individuals, the smaller their investment in health. Elderly individuals are likely to be less productive in farm activities than prime age adults.

The effect of sex is not significantly different from zero in the clinic equation, and is positive and significant at the 1% level in the hospital equation. This result is consistent with males being more productive in farm activities than females.

The effect of education appears to be negligible. This most likely is a result of the small variation in education in the sample.

The farm input variables perform as expected. The number of adults in the household has a negative effect on the probability of going to both clinics and hospitals. The greater the number of adults, the larger the labor force and the lower the marginal productivity of an individual. The lower the marginal productivity, the smaller the return to the investment in health. The coefficients on the number of children in the household are positive. The greater the number of children (who take up adult time), the higher the marginal productivity of an adult. Finally, the coefficient on hectares of land is positive and significant in the hospital equation, which is consistent with the notion that the greater the amount of land, the higher the marginal productivity of an individual.

VI. Time Price Elasticities and Income Effects

Since travel time and income enter the demand functions in a highly non-linear fashion, it is hard to assess the total magnitude of the travel time and income effects. To facilitate such analysis, we present arc travel time elasticities of the demand for clinic and hospital care by income quartiles in table 3. The arc elasticities are found by sample enumeration within each income quartile. Four half-hour travel time ranges are used for the arc elasticities calculations. The zero to two hour time range covers approximately 90% of the households. A vertical reading of table 3 reflects the change in the time price elasticity moving down the demand curve, holding income constant. A horizontal reading reflects the change in the time price elasticity as income rises, holding travel constant.

Two types of elasticities are considered in table 3. The first type is the total own time price elasticity, which, for example calculates the total percentage change in clinic demand with respect to a 1% change in clinic travel time. An increases in clinic travel time causes some individuals to

Table 2: Nested Multinomial Logit
Model of Provider Choice

	Coefficient	T-statistic
Access Cost $\left(\frac{wT}{Y}\right)$ a/	-1.059	(2.18)
Nuisance parameter (T)	-0.289	(1.79)
Sigma	0.460	(2.69)
Clinic Alternative		
Constant	1.773	(1.70)
Age	-0.038	(2.01)
Sex	-0.042	(0.13)
Education	-0.077	(0.96)
Healthy days	-0.065	(1.91)
Adults	-0.122	(1.69)
Children	0.108	(1.65)
Log (land)	0.203	(0.79)
Hospital Alternative		
Constant	1.655	(1.53)
Age	-0.055	(2.92)
Sex	0.634	(1.74)
Education	0.093	(1.08)
Healthy days	-0.099	(2.82)
Adults	-0.122	(1.60)
Children	0.104	(1.59)
Log land	0.652	(2.54)
Log likelihood	-884.02	
N	1030	

a/ This variable was rescaled by multiplying it by 125 for estimation.

substitute hospital care for clinic care, and others to substitute self-care for clinic care. The second type of elasticity is the net elasticity, which examines the portion of demand that leaves the professional health care market. For example, it calculates the percentage of clinic demand that substitutes self-care for clinic care. The net elasticity has policy interest as it measures the number of individuals moving in and out of the professional health care market as a function of the distributional structure of health care supply.

We begin with a discussion of the own time price elasticities. Demand is substantially more elastic at higher travel times. Over the zero to two hour travel time range, the demand elasticities more than tripples. (Table 3). Specifically, the clinic demand elasticity for the lowest income quartile increases from -0.531 (for the 0 to 0.5 hour range) to -1.962 (for the 1.5 to 2.0 hour range). For the highest income quartile, the clinic demand elasticity increases from -0.230 to -0.854. Similar magnitudes are found for hospital demand.

The results also show that demand is vastly more elastic at the lower income levels. Specifically, the clinic demand elasticity for the lowest income quartile is more than double the elasticity for the highest income quartile. The clinic demand elasticities for the 0 to 0.5 hour interval range from -0.531 for the lowest income class to -0.230 for the highest income class. For the 1.5 to 2.0 hour interval, they range from -1.962 to -0.854. Again a similar pattern emerges for hospital care.

The net travel time elasticities, as expected, are lower than the own price elasticities, but not insignificant in magnitudes. This implies that significant numbers of individuals are forced out of the market due to travel time rationing. In the lowest income quartile, the net clinic demand elasticity rises from -0.387 for the 0 to 0.5 hour interval to -1.039 for the 1.5 to 2 hour interval, and the net hospital demand elasticity rises from -0.361 to -0.807. In the highest income quartile, the net clinic demand elasticity rises from -0.102 to -0.326, and the net hospital elasticity rises from -0.87 to -0.266.

VII. Summary

This paper investigates the role of travel time as a health care rationing device in a developing country. Previous studies on the demand for health care demand in developing countries have typically found small travel time effects. These studies model the demand for health care as a discrete choice amongst providers with travel time entering the utility function as a nuisance parameter, and with the price effect specified to be independent of income. We derive a discrete choice specification from a theoretical model that has a natural interaction between price and income, and that includes travel time in the budget constraint as an access price, as well directly in the utility function as a nuisance parameter.

A Nested Multinomial Logit parameterization of the model was estimated using 1985 data from Côte d'Ivoire. Our findings indicate that indirect access costs such as travel time play an important role in rationing health care utilization. The results also show that health care demand amongst poorer individuals is substantially more travel time elastic than amongst the rich.

Table 3: Arc and Net Travel Time Elasticities

Travel Time-Range (hours)	Quartile 1 (lowest) Own	Net	Quartile 2 (lowest) Own	Net	Quartile 3 (lowest) Own	Net	Quartile 4 (highest) Own	Net
Clinics								
0 - 0.5 hour	-0.531	-0.387	-0.339	-0.203	-0.293	-0.148	-0.230	-0.102
0.5 - 1.0 hour	-0.991	-0.638	-0.646	-0.355	-0.545	-0.256	-0.415	-0.174
1.0 - 1.5 hours	-1.486	-0.861	-1.003	-0.510	-0.835	-0.367	-0.625	-0.250
1.5 - 2.0 hours	-1.962	-1.039	-1.392	-0.660	-1.150	-0.479	-0.854	-0.326
Hospitals								
0 - 0.5	-0.696	-0.361	-0.439	-0.194	-0.341	-0.136	-0.226	-0.087
0.5 - 1.0	-1.242	-0.557	-0.812	-0.330	-0.618	-0.231	-0.403	-0.147
1.0 - 1.5	-1.722	-0.691	-1.222	-0.465	-0.924	-0.326	-0.598	-0.207
1.5 - 2.0	-2.128	-0.807	-1.648	-0.593	-1.250	-0.422	-0.807	-0.266

NOTES

1/ See Ainsworth (1983), de Ferranti (1985) and Jimenez (1986) for a discussion on health care pricing methods in developing countries.

2/ Studies of the demand for health care in developing countries include Akin et.al. (1981, 1985 and, 1986), Birdsall and Chuhan (1983) and (1986), Dor and van der Gaag (1987), Gertler, Local, and Sanderson (1986), Heller (1983), Musgrove (1983), and Mwabu (1986).

3/ For detailed information on this survey, see Grootaert (1985), and Ainsworth and Muñoz (1985).

4/ For a description on how total household consumption was calculated see Glewwe (1986).

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April 1987

LIVING STANDARDS MEASUREMENT STUDY

The Living Standards Measurement Study (LSMS) was established by the World Bank in 1980 to explore ways of improving the type and quality of household data collected by Third World statistical offices. Its goal is to foster increased use of household data as a basis for policy decision making. Specifically, the LSMS is working to develop new methods to monitor progress in raising levels of living, to identify the consequences for households of past and proposed government policies, and to improve communications between survey statisticians, analysts, and policy makers.

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ABSTRACT

This paper reviews the health status of The Peruvians and the financing and spending patterns of Peruvian health institutions. Between 1975-85 declining income per capita of the population has been accompanied by unsuccessful attempts to reduce total government expenditures. However, government expenditures in social programs declined from one third of the budget in 1973-75 to less than one fifth in 1981. Expenditures in health programs as a proportion of the government budget declined from 6.4 percent in 1970 to around 4.5 percent in 1980-85 (to 0.6 percent of the GDP). This amounts to approximately 5.0 U.S. dollars per capita. Central government revenues the main source of financing of public health institutions. Expenditure by corporate health institutions and private institutions and individuals account for approximately 90 percent of total resources spent on health related goods and services. Corporate institutions spent around 100 U.S. dollar per "affiliated" member, private individuals spent between 10 and 20 U.S. dollars per capita. These findings call for the need to explore the actual scope of health government programs and the role that nongovernment institutions may play in implementing health programs.

Child and infant mortality and the high incidence of environmental related diseases appear as the most critical health problems in Peru. Observed mortality and morbidity patterns and the tendency of Peruvian health institutions to concentrate on curative rather than preventive services, suggest that there might be a misallocation of resources. Analysis of health related indicators also show a high degree of inequality in the spatial distribution of health resources and sanitation services.

Table of Contents

INTRODUCTION

This paper reviews the health status of the Peruvians and the financing and spending patterns of Peruvian health institutions. The paper analyzes the main trends and relative importance of institutions providing health services and explores such alternative financing policies as users' fees, cost-recovery programs, and community participation. It also analyzes the potential for implementing risk-sharing programs. Although the emphasis is on public institutions, the study presents data on corporate health institutions -- institutions that include the Peruvian Institute of Social Security (IPSS), the for-profit and nonprofit organizations of the private sector, and the health services of the army, corporate government, and private institutions.

The paper has four sections. Section 1 describes the evolution of the Peruvian economy during the last fifteen years. Section 2 analyzes the relative importance of each part of the health sector in terms of coverage, number of facilities, and financial resources. Section 3 presents the main indicators of the health status of the population, the major health problems affecting the Peruvian population, and the issues associated with the distribution of facilities, manpower, and financial resources. This section also reports on some of the findings from studies using data from the 1984 Nutrition and Health National Survey (ENNSA) in Peru. Section 4 summarizes the findings on the major problems affecting the health sector.

1. THE PERUVIAN ECONOMIC SITUATION, 1970-85

1.1 Growth, Inflation and Income

The dynamics of Peru's economic growth during the last twenty years have been shaped by two completely different approaches to managing the economy: a period of nationalistic popular reforms from 1968 to 1975 followed by a period of stabilization, structural adjustment, and liberalization from 1975 to 1985.

During the first period, a self-proclaimed Revolutionary Government of the Armed Forces seized power and promised to implement drastic social reforms such as nationalization, agrarian reform, educational reform, worker participation in the management of firms (Comunidad Industrial), and promotion of cooperatives and "social property." The government undertook large investment projects and nationalized certain strategic industries. It introduced subsidies for oil, gasoline, and basic staple foods; prices of other basic products were also controlled and/or heavily subsidized. The government severely restricted foreign trade by increasing the existing tariff rates and by introducing many nontariff restrictions.

The second period began in 1975 with a coup d'état against the reformist military government. A group of more conservative militarists seized power and called for a return to a more orthodox management of the economy, with more reliance on the private sector. In an attempt to reduce government deficits and disequilibrium in the external sector, the new government drastically reduced subsidies and dismantled several social reforms of the first period. The government was committed to a program of stabilization and the reorientation of the economy toward a free-market strategy of growth. A new civilian government came to power in 1980. Without changing the basic orientation in the management of the economy this government began consecutive drastic but unsuccessful stabilization programs. It also began a medium-term strategy of structural adjustment leading toward trade liberalization.

Data in Table 1.1 show the behavior of some of the macroeconomic aggregates during the two periods. During the 1970-75 period of popular reforms, average yearly rate of gross domestic product (GDP) growth was 4.8 percent, slightly below the historically high rate of 5.5 percent a year in the fifties and sixties. With a population growth rate of 2.7 percent a year, per capita income increased at an average rate of 2.04 percent. Also during this period inflation rose from a historically low yearly rate of about 5 percent to 13 percent in 1975 and 30 percent in 1976.

During the 1975-85 adjustment and liberalization period, while the population growth rate declined to 2.6 percent, the average rate of GDP growth dropped to 1.23 percent a year; per capita income declined by an average yearly rate of 1.23 percent. Inflation skyrocketed from 30 percent during the mid-seventies, to 60 percent in 1980, 110 percent in 1984, and 170 percent in 1985. Economic recession was particularly severe during the last five years of the structural adjustment and trade liberalization programs.

Between 1980 and 1985 the economy remained almost stagnant; GDP fell at a rate of 0.7 percent a year, and per capita income declined even faster at 3.4 percent a year. In 1985 income per capita was about 6 percent lower than at the beginning of the seventies.

TABLE 1.1: **Peru: Gross Domestic Product, Inflation, Population, Per Capita Income, 1970, 1975, and 1980-85**

	1970	1975	1980	1981	1982	1983	1984	1985
Real GDP,(bill. 1980 US$)	6.2	12.2	14.5	16.7	14.4	11.1	10.0	14.2
Rate of growth (p.a. real terms)	5.0	-0.5	0.1	3.1	0.6	-12.5	4.4	1.9
Inflation rate	5.0	13.0	59.2	75.4	64.4	111.2	110.2	169.9
Population (millions)	12.8	14.6	16.6	17.0	17.4	17.9	18.4	18.9
Income Index (1970=100) (real terms)	100.0	110.7	113.9	114.6	112.8	95.9	97.4	96.7

Source: Elaborated data from INE (1986); Suarez, R. (1986)

1.2 Government Finances: Revenues, Expenditures, and Deficits

Since the mid-seventies, management of government finances and control of government deficits have been among the key issues of Peru's stabilization programs. Data on the evolution of government finances are presented in Table 1.2.

During the first phase of the military government, after two years of austerity measures and policy reforms (1969-70), the government pursued expansionary fiscal policies. Government expenditures, as a proportion of the GDP, increased from an average of 16-18 percent during previous years to above 20 percent during the early seventies. Revenues did not increase in proportion, and domestic and foreign borrowing were heavily used to finance rising government deficits.

During the stabilization and liberalization period, efforts to reduce government expenditures were unsuccessful. At the beginning of the seventies, government expenditures represented about 17 percent of GDP; in the mid-seventies, they rose to almost 20 percent and have remained around this level in the eighties. For examples, in real terms, government expenditures increased considerably. In 1981 government expenditures in real terms were almost twice the level observed in 1970. Between 1975 and 1980, government revenues also rose substantially. From 1980 on, however, while government expenditures remained high, government revenues began to fall.

TABLE 1.2: **Peru: Public Sector Finances, 1970, 1975, 1980-85**
(millions of intis)

	1970	1975	1980	1981	1982	1983	1984	1985
GDP 1980 intis (000')	3364.7	4247.4	4971.8	5123.3	5168.9	4549.6	4765.8	4842.4
Real Rate of growth	5.0	-0.5	0.1	3.1	0.6	-12.5	4.4	1.9
GDP Current Prices	240.7	550.2	4971.8	8375.3	13777.0	25334.0	57114.2	155293.5
Deflactor GDP	7.2	13.0	100.0	161.5	266.5	556.8	1198.4	3207.0
Central Government								
Total Expenditure	42.1	106.7	1046.7	1830.2	2634.0	6048.0	10728.3	23869.0
Total Revenue	38.8	88.6	1008.4	1509.7	2459.6	3732.0	5228.1	21667.0
Deficit	-3.3	-18.1	-38.3	-320.5	-174.4	-2316.0	-5500.2	-2202.0
Expend. (1980 intis)	588.5	823.7	1046.7	1133.1	988.2	1086.1	895.2	744.3
Revenues (1980 intis)	542.4	684.0	1008.4	934.7	922.8	670.2	436.2	675.6
Expend. Index (1970=100)	100.0	140.0	177.9	192.5	167.9	184.6	152.1	126.5
Revenue Index (1970=100)	100.0	126.1	185.9	172.3	170.1	123.6	80.4	124.6
Total Government								
Expend/GDP (%)	17.5	19.4	21.1	22.1	19.1	23.9	18.8	15.4
Deficit/GDP (%)	-1.4	-3.3	-0.8	-3.9	-1.3	-9.1	-9.6	-1.4

Government deficits, around 3-4 percent of GDP between 1971 and 1974, increased to 6 percent in 1976 and 7.5 percent in 1977. At this time the government attempted to control government expenditures. Favorable export prices, resulting in additional export tax earnings, were used in part to balance the budget. Thus government deficits, as a proportion of GDP, were reduced to 4.7 percent in 1978, 0.5 percent in 1979, and 0.8 percent in 1980.

During the eighties, amidst a process of structural adjustment and liberalization, inconsistent expansionary fiscal and monetary policies were pursued. From 1980 to 1984 high government expenditures continued; in 1984 total government expenditures represented almost 24 percent of GDP. An unsuccessful reform of the tax system and the economic recession resulting from falling terms of trade led to a drastic reduction of government revenues. Deficits rose sharply from 2.8 percent of GDP in 1980 to more than 9 percent in 1983 and 1984.

Recurrent government deficits were financed by borrowing in domestic and foreign financial markets. Deficits were financed by an expansion of the money supply and intensive use of foreign financing, leading to severe inflation and an acute external debt. This evolving pattern of government finances explains the most important changes in the makeup of government expenditures, analyzed in the following section.

1.3 Government Revenues and Expenditure Patterns

Tables 1.3 and 1.4 present data on the composition of government revenues and expenditures for the years 1973, 1975, 1980, and 1982. Changes in revenue and expenditure patterns suggest that some important changes in income distribution might have occurred during these years. Reform of the tax system during the eighties reduced the usually progressive income tax and increased the usually regressive taxes on goods and services.

Overall, during 1973-82, tax revenues were the main source of government financing; taxes represented around 90 percent of total government revenues. Non-tax revenues, comprising fees on government services and grants, represented only 10 percent.

Government revenues from income taxes declined from 24.4 percent in 1973 to 15 percent in 1982; between 1973 and 1981 revenues from income taxes on individuals declined from 5.9 percent to 1.6 percent. Revenues from the general tax on goods and services for domestic and international transactions increased from 54.4 percent in 1975 to 71.4 percent in 1982. Revenues from taxes on payroll and from non-tax sources remained relatively constant. There are no revenues from the social security system because in Peru social security contributions are not paid to the government; they are directly paid to the Peruvian Institute of Social Security (IPSS), an autonomous institution.

Increases in government expenditures have not been uniform for all government functions. Between 1973 and 1981 the most important changes were reductions in the share of government expenditures on such social programs as health, education, housing and community activities.

Expenditures for these social programs declined from approximately one-third of the total budget in 1973-75, to less than one-fifth in 1981. The budget for education was reduced the most; less significant reductions were made in defense and general public services.

In 1981 a single item--other purposes--absorbed the largest proportion of total government expenditures. This item comprises mainly the interest and amortization payments on domestic and foreign public debt. Debt-related payments increased from 10 percent of government expenditures in 1973 to 21 percent in 1981. Estimates for 1984/85 show that these payments represented 25-27 percent of total government expenditures. 1/

TABLE 1.3: **Peru: Structure of Government Revenues, Selected Years (millions of intis)**

Government Revenues	1973	(%)	1975	(%)	1980	(%)	1982	(%)
Total Rev. and Grants	51.9	100.0	88.6	100.0	1008.4	100.0	2459.6	100.0
Tax Revenues	47.3	91.0	79.5	89.8	936.7	92.9	2232.7	90.8
Income Tax	12.7	24.4	21.0	23.7	267.9	26.6	369.6	15.0
Individual	3.1	5.9	5.0	5.6	16.4	1.6		
Corporate	8.8	17.0	11.1	12.5	247.8	24.6		
Social Security	0.0	0.0	0.0	0.0	0.0	0 0	0.0	0.0
Employers' Payroll Tax	1.8	3.4	3.4	3.8	33.9	3.4	108.8	4.4
Taxes on Property	1.9	3.6	3.5	4.0	56.2	5.6	146.3	5.9
On Goods and Services	18.6	35.8	31.8	35.9	380.4	37.7	1125.7	45.8
On Intntl. Transac.	9.6	18.6	20.8	23.5	283.0	28.1	630.8	25.6
Other Taxes	2.7	5.3	0.8	0.9	5.6	0.6	25.1	1.0
Non-Tax Revenues	4.5	8.7	9.0	10.2	70.5	7.0	221.3	9.0
Grants	0.1	0.2	0.1	0.1	0.9	0.1	5.7	0.2

Source: Elaborated from IMF (1984) p.645-47.

TABLE 1.4: **Peru: Government Expenditure Patterns, by Functions**
(millions of intis)

Expenditure by Functions	1973	(%)	1975	(%)	1980	(%)	1981	(%)
Total Expenditure	64.2	100.0	106.7	100.0	1046.7	100.0	1830.6	100.0
General Public Service	8.8	13.6	13.1	12.2	129.2	12.3	191.2	10.4
Defense	9.8	15.2	16.7	15.7	130.7	12.5	252.9	13.8
Education	14.7	22.9	21.9	20.5	116.0	11.1	207.6	11.3
Health	3.5	5.5	5.5	5.1	47.4	4.5	97.1	5.3
Social Sec. & Welfare	0.2	0.2	0.3	0.2		0.0	2.8	0.2
Hous. & Commut. Act.	2.5	3.9	2.6	2.4	15.6	1.5	16.9	0.9
Other Community Serv.		0.0		0.0		0.0	23.0	1.3
Economic Sectors	14.4	22.4	26.3	24.6		0.0		0.0
Other Purposes (public debt payments)	7.2	11.2	20.5	19.2	202.1	19.3	389.8	21.3
Total Social Programs*	20.9	32.6	30.2	28.3	179.0	17.1	324.4	17.7

* Education, Health, Social Security and Welfare and Housing.

Source: Elaborated from IMF (1984) p.645-47.

In summary, the more intensive use of the general sales tax, rather than the income tax, and the reduction of government expenditures on social programs seem to have adversely affected income distribution. There is general agreement on the effects of this type of change in the system on income distribution; however, the effects on distribution that result from changes in government expenditures on social programs are less clear.

Data on the changing patterns of government revenues and expenditures also suggest that even when maintaining the regressive general sales tax, more revenue can be collected from individual and corporate income taxes. The problem seems to be one of political feasibility: increasing the tax burden of the politically strong high- and middle-income groups. Also, redistribution of expenditures toward social programs requires reducing the budget for defense and general services, reducing expenditures in the economic sectors, or reducing payments on the outstanding public debt, thus reducing the "other purposes" expenditures.

The alternative for the current government has been to limit the amount of resources to be used for amortization payments to foreign creditors and to reallocate these resources for social and economic programs. A short-term consequence of limiting such payments has been to have the Peruvian government declared "ineligible" for new loans by international organizations. Access to international capital markets has also been severely curtailed. Medium-term consequences of this situation are not yet foreseeable.

2. PUBLIC HEALTH SECTOR EXPENDITURE, 1970-85

2.1 The Peruvian Health Sector: An Overview

In theory Peru's National System of Health Services (Sistema Nacional de Servicio de Salud) is in charge of coordinating the health programs of government and nongovernment health institutions: the Ministry of Health (MOH), the Health Services of the Army and the Police, and the private health sector. But, as stated in the last National Health Plan, these institutions act independently of the National Health Services, and their actions lack coordination. In practice they are autonomous institutions with their own programs. The only institution under direct government policy intervention is MOH. 2/

To analyze the financing of the health sector, Peruvian health institutions are classified into three groups: (1) public health sector, comprising all institutions providing both preventative and curative health services to the general public. Access to these services is determined mainly by space availability and quotas; in some cases these institutions charge a nominal fee. (2) The corporate health sector, comprising institutions providing essentially curative health services to associated members or employees; payment for services are included as fringe benefits or retained from wages or salaries as contributions to a risk-sharing fund. Only the insured or affiliated members have access to these services. (3) The private health sector, comprising those individuals and institutions providing formal and informal curative care by implicit or explicit price-rationing schemes; access to the system is based on space availability and price rationing, or ability to pay.

This classification distinguishes among the types of health services provided by the various health institutions and identifies factors determining supply of (provision) and demand for these services. The first broad distinction is preventative and curative health services. Preventative includes those actions - that by their nature - can be classified as public goods. Marketable preventative actions will be considered as curative services. They can be thought of as a composite commodity consisting of medical care and instructions, drugs, and other factors affecting a particular treatment.

In Peru, preventative actions are the responsibility of public health institutions: MOH and local government institutions. Curative services are provided by all the institutions of the health sector. Public and private health institutions provide only medical care; corresponding drugs and other health-related goods and services are the patient's responsibility (for outpatients). The corporate health sector, however, provides both medical care and prescription drugs. These are important issues that should be considered in modeling health services and in evaluating the efficiency of each health institution.

Table 2.1 presents rough estimates of the relative importance of the three health sectors in the Peruvian economy by the number of centers, for example, hospitals and sanitary posts, and by the proportion of the population covered by each of the sectors. 3/

MOH is the most important institution of the public health sector both in the number of centers under its supervision and the number of people served. Sociedades de Beneficencia Publica and the local governments have fewer facilities; however, they provide services to relatively large segments of the population. As a whole, public health institutions have about one-third of the total number of hospitals, more than 70 percent of the health-care centers, and about 90 percent of the sanitary posts. These institutions serve an estimated 56.5 percent of the total population.

The corporate health sector, consisting of public- and private-funded institutions, provides health services to affiliated employees, members, and their relatives. These include IPSS; the Health Services of the Army and the Police (Sanidad de las Fuerzas Armadas y Fuerzas Policiales); and such state-owned health institutions and private enterprises such as Minero Peru, Southern Peru Copper Corporation, Marcona, Centromin, and Collective Land Ownership Organizations (SAIS). With the exception of IPSS and the Army, most corporate health facilities belong to private, state-owned, or collective enterprises. Although these services are not open to the general public, people covered by specific corporate health programs might have access to IPSS services and to services from public and private health institutions. Although some of these corporate health institutions might have some extension programs that cover a broader group of people, they basically provide medical services to their associates or affiliated workers.

TABLE 2.1: **Peru: National Health System, Institutions and Coverage: 1983-84**

Health Sectors	Hospitals	Health Centers	Sanitary Post	Other	Covered Population (000)	(%)
Public Health Sector	116	463	1405	13	10844.6	56.5
Ministry of Health	109	451	1402	9	10046.6	52.3
Soc. Benefit Public	5	1		1	500.0	2.6
Other Public Institutions	2	7	2	3	48.0	0.3
Local governments		4	1		250.0	1.3
Corporate Sector	98	149	130	0	3190.8	16.6
Social Security	18	67	17		2680.0	14.0
Army and Police	13	54	65		340.0	1.8
State Owned Firms	10	4	7		60.0	0.3
Cooperatives, Agricultural	13	7	16		56.0	0.3
SAIS, Agricultural	1		11		19.8	0.1
Private Firms	43	17	14		35.0	0.2
Other Ministries					25.0	0.1
Private Sector	116	18	3	4	346.9	1.8
Private Institutions	111	9		4	251	1.3
Other Non-Gov. Institutions		6				0.0
Non Profit, Private	5	3	3		23.4	0.1
Private Insurances					72.2	0.4
TOTAL	330	630	1538	17	14382.3	74.9
Total Population					19197.9	100.0
Non-covered					4815.6	25.1

Source: Elaborated from BCR (1984) p.7; ANSSA (1985).

The private health sector includes for-profit and nonprofit institutions and individuals who provide health services to the general public through a price-rationing system. Although the number of private hospitals is similar to the number of hospitals in the public health sector, it is estimated that the private sector serves a relatively small proportion of the population, in contrast to the relatively high segment covered by the corporate and public health institutions.

2.2 Government Expenditures on Health Programs

A large proportion of the expenditures on health in countries like Peru comes from government expenditures on health programs. Furthermore, even though demand or expenditures for health services might be dependent on income, on the supply side, government decisions about provision of health services are influenced mainly by policy decisions on the role of the government in the economy, priorities assigned to social programs, and the financial constraints faced by the public sector. On the demand side, because services are provided free of charge, the main issue becomes the distributive impact of government expenditures on health, that is, distribution of health centers and accessibility of public health services to different social groups.

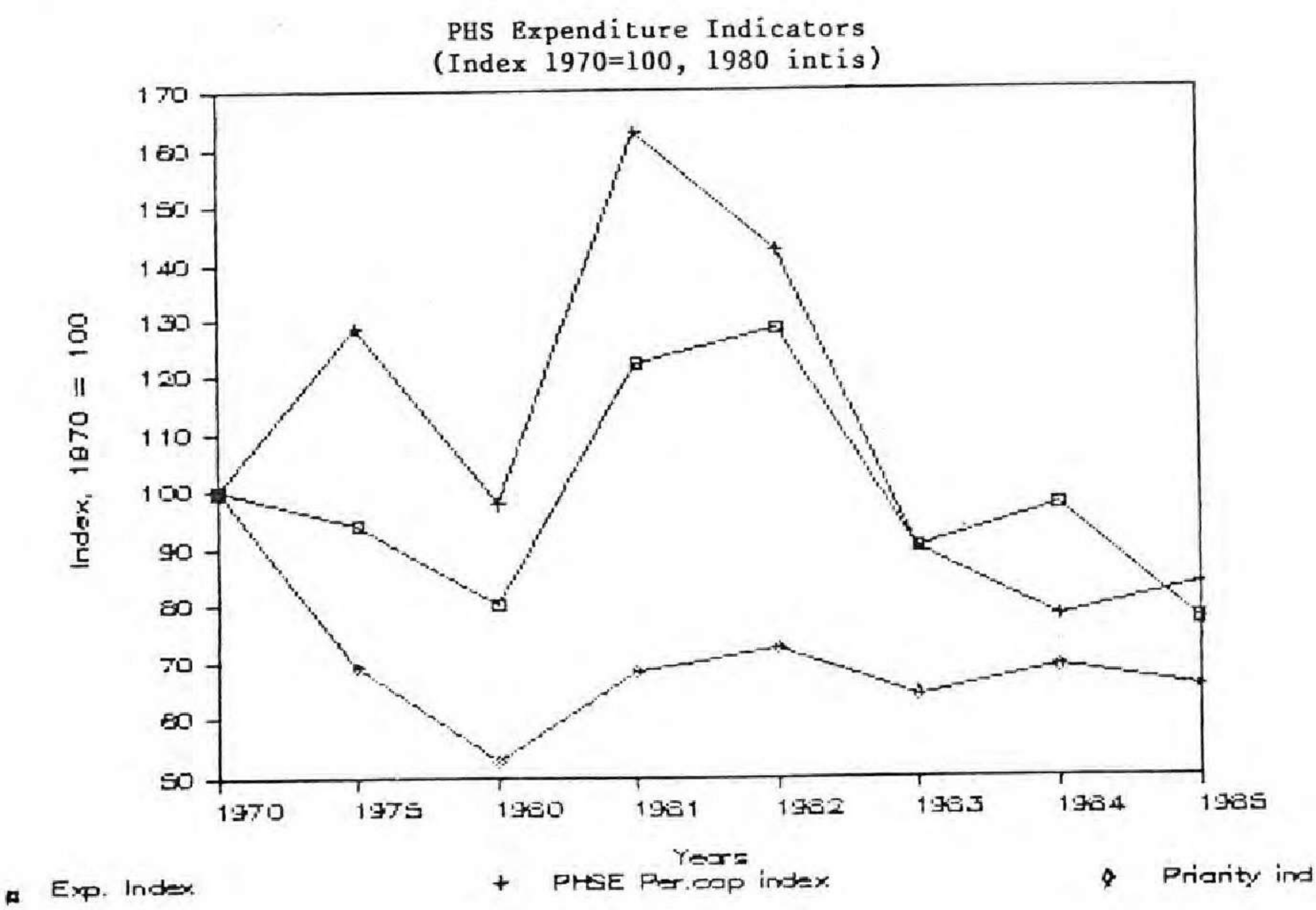
Table 2.2 shows the evolution of public sector expenditures and the amount of resources assigned to the MOH budget. Data show that total government expenditures as a proportion of GDP increased from 18.6 percent in 1970 to an average of 20 percent between 1975 and 1984. In 1985 the percentage declined to 15.4. In real terms, expenditures throughout the eighties have been significantly higher than expenditures at the beginning of the seventies.

Public expenditures on health show a different pattern evolving. The amount of resources devoted to MOH, as a percentage of the government budget, declined from 6.4 percent in 1970 to around 4.5 percent during the last ten years. As a proportion of GDP, government expenditures on health declined from 1.2 percent during the seventies to 0.6 percent in 1985. Although total government expenditures show a slight increase in relation to that of the seventies, expenditures on health programs in real terms, after significantly increasing during 1980-81, declined approximately 23 percent from the level in 1970.

The evolving pattern of government expenditures on health programs is reflected in the real public health expenditure priority index (see figure p.16). The index increased from a base of 100 in 1970 to 122 in 1981 and 128 in 1982, then declined to 77 in 1985. [4/]

TABLE 2.2: Peru: Government Revenue and Expenditure in Public Health Programs, 1970-85

Central Government	1970	1975	1980	1981	1982	1983	1984	1985
Total Expenditure	44.8	110.7	950.9	1859.8	3071.8	5166.5	10728.3	23869.6
Total Govern. Expend/GDP (%)	18.6	20.1	19.1	21.9	21.6	19.5	18.9	15.4
Government Expend (1980 intis)	626.3	854.6	950.9	1122.2	1113.2	879.7	889.0	741.3
Index, 1970 = 100	100.0	136.5	151.8	179.2	177.7	140.5	142.0	118.4
Ministry of Health, Total Expenditure (billion intis)	2.9	4.9	32.1	81.2	141.9	211.8	472.3	995.8
Total Expenditure (million US$)	74.2	108.9	93.9	160.2	143.34	93.3	82.9	91.4
(% of GDP)	1.2	0.9	0.6	1.0	1.0	0.8	0.8	0.6
(% of Total Government Expend.)	6.4	4.4	3.4	4.4	4.6	4.1	4.4	4.2
Gov. PHS Expend. (1980 intis)	40.1	37.8	32.1	49.0	51.4	36.1	39.1	30.9
Index, 1970=100	100.0	94.3	80.0	122.1	128.2	89.9	97.5	77.1
PHS Expend. per capita	3.1	2.6	1.9	2.9	3.0	2.0	2.1	1.6
Per capita index (1970=100)	100.0	82.7	61.7	92.0	94.3	64.3	67.9	52.3
Sector Priority index (base 1970=100)	100.0	69.1	52.7	68.2	72.1	64.0	68.7	65.1



Per capita public expenditures on health, assuming universal coverage, declined from a high of US$9 during 1980-81 to less than US$5 over 1984-85. By excluding those not covered (see Table 3.1) and by assuming a constant coverage rate, per capita expenditures would have been US$12 in 1980-81 and US$6.6 in 1984-85. Excluding the population receiving curative services from corporate and private health institutions and assuming a constant rate of coverage during 1980-85, per capita expenditures on the 52 percent of the population covered by MOH would increase to US$17 for 1980-81 and US$9.6 for 1984-85.

Although data on the proportion of government expenditures on preventative health care is not readily available, such expenditures do not seem to be an important part of the government budget; instead a large proportion of the resources are spent on curative services.

2.3 Public Health Sector: Financing and Expenditure Patterns

The relative importance of government finances in the budget of MOH is presented in Table 2.3. The central government is the main source of MOH financing. During the last two years the central government provided more than 85 percent of the financial resources for MOH. Foreign borrowing was the next source, providing about 7 percent of the funds. Donations and funds from "other" services represented about 3-5 percent of MOH resources. Borrowing from domestic sources and revenues from service fees were minor, representing about 3 percent of the total budget. Aggregate estimates of the sources of financing, based on actual MOH revenues, show that central government financing and MOH revenues represent slightly higher proportions than those contained in the planning budgets; they also show that borrowing figures were usually overestimated. [5/]

TABLE 2.3: Peru: Ministry of Health, Sources of Financing, 1984-85
(billions of Soles)

Sources	1984	%	1985	%
Central Government	402.7	85.3	853.2	85.7
Revenues	13.9	2.9	31.9	3.2
Borrowing				
Domestic	0.9	0.2	-	-
Foreign	39.5	8.4	63.2	6.3
Donations	7.4	1.5	13.1	1.3
Others	7.8	1.6	34.4	3.5
TOTAL	472.3	100.0	955.8	100.0

Source: Ministerio de Salud (1985), Table 45.

These data imply that despite the severe reduction in the amount of real resources transferred from the central government, the public health sector has been unable to obtain or use alternative sources of financing, for example, user fees, financing from local governments, contributions from institutional users. Although introducing such alternative sources of financing is difficult in periods of economic recession, these sources might have contributed to sustaining higher revenue levels.

The composition of MOH actual expenditures is presented in Table 2.4. The major change over time is the increase in current expenditures at the expense of capital expenditure accounts. Current expenditures increased from 85 percent in 1980 to around 90 percent in 1982 and 1984.

TABLE 2.4: **Peru: Ministry of Health, Actual Expenditure Patterns, 1980, 1982, 1984 (%)**

Expenditure Items	1980	1982	1984
Current Expenditure	84.1	91.0	89.6
Wages and Salaries	52.5	70.0	69.7
Supplies and Materials	25.1	21.2	16.6
Services	3.1	3.5	3.6
Transfer	14.8	1.6	1.4
Pensions	4.4	3.6	8.7
Capital Expenditure	15.9	8.9	10.4
Research	2.6	3.5	3.3
Constructions	84.8	82.5	56.9
Equipment and Durables	7.5	14.0	39.0
Transfers	5.1	3.4	0.8
TOTAL	100.0	100.0	100.0
(Real terms, millions of intis, 1980)	(49.0)	(61.5)	(58.0)

Source: ANNSA (1985), Tables 4.7.4, 4.7.6, pp. 100,102.

Among the current expenditures, the payroll, including wages, salaries, and pensions, is the most important increasing from 52.5 percent of total expenditures in 1980 to around 70 percent during 1982-84. The more drastically reduced current expenditures are those of supplies and transfers. 6/

Reductions in expenditures on supplies and medicine suggest that the health service provided by this institution is basically medical care. Drugs and materials that are part of the treatment are the responsibility of patient.

2.4 Corporate Health Sector: The Social Security System

The most important corporate health institutions in Peru are IPSS, SAID, the Health Services of the Army and Police, hospital and clinic cooperatives, private health institutions, and decentralized state-owned enterprises.

The social security system in Peru dates back to 1850, when retirement and unemployment pension plans were created for civil servants and army personnel. In 1911 a risk-sharing plan for blue-collar workers was introduced. [7/] The first social security program that covered medical assistance and maternity for blue-collar workers was created in 1936. In 1948 this system was expanded to include government and private-sector white-collar workers, and in 1950 to include army personnel.

During the sixties new social security plans were created that extended coverage to other workers. These offered different types of contributions and benefits, and their funds were administered independently of IPSS. Special pension plans and contribution requirements were created for special interest groups; for example, employees from the executive, legislative, and judiciary branch of the government; other elected representatives; workers from the central bank; foreign service employees; and workers from the decentralized government institutions were all under different contribution and benefit plans. Also, special benefit plans were created for individual groups of blue-collar workers, for example, taxi drivers, stevedores, domestic workers, fishermen, independent and self-employed workers.

A unification of the social security programs began in the early seventies. In 1972 and 1973 retirement and pension plans of all branches of the army and those for the blue- and white-collar workers from the public and private sectors were unified. In 1979 health-care programs and maternity care for blue- and white-collar workers from the public and private sectors were also integrated. 8/

In theory by 1980 all the social security programs, with the exception of the army's, were unified into IPSS. However, despite the efforts at unifying the system, the old differentiation between white-collar and blue-collar health institutions persists. Although important gains have occurred in making medical care and maternity programs uniform, Peru's social security system is still highly stratified, and its coverage is limited. Recent reforms of the current government are directed toward effective unification of the system and toward provision of medical care and other social security programs to all the social groups; however, little progress has been made toward this goal.

Studies on income distribution in Peru show that the social groups covered by the social security system are mainly urban groups who have formal jobs in the modern sector of the economy. They include military personnel, public and private sector white-collar workers, and blue-collar workers from the largest modern-sector firms. They constitute the middle- and high-income groups in the upper quartile of the income distribution. 9/

Data on the budget of the social security system, its proportion of GDP, and the growth of the system's financial resources in real terms are presented in Table 2.5.

TABLE 2.5: **Peru: Social Security System, Total Expenditures, 1961-82 (Millions of intis)**

Year	IPSS Total Budget	Real Terms Index*	% of GDP	Med. & Maternity Expenditure** %	% of GDP
1961	1.7		2.3	N.A.	
1965	3.3		2.5	N.A.	
1970	-	-	-	-	
1975	19.4	100.0	3.1	56.7	2.0
1980	179.3	137.7	3.2	65.2	2.4
1981	337.9	160.6	3.6	66.9	2.7
1982	521.9	140.0	3.4	63.1	2.3

* Index 1975=100.0
** Includes monetary reimbursements.
Source: Elaborated from Cepal (1985) p.332-333, and IMF (1986).

In real terms IPSS's financial resources increased from 19.4 millions in 1975 to 27.2 millions in 1982. The medical care and maternity program was the most important in terms of expenditures absorbing approximately two-thirds of the total resources. During 1980-82 the IPSS budget was more than four times that of MOH. Overall expenditures on maternal and medical assistance programs for this period were around 2.7 times that of the MOH budget (see Table 2.2).

The social security system is financed by contributions from workers, employers, and the government. Workers' contributions are retained from their wages and salaries by their employers who are responsible for paying their own and their workers' social security contributions. The government contributions to the social security system are as an employer and through transfers to the system.

The share of contributions to the social security system by employees, employers, and the government are presented in Table 2.6. In 1983 workers' contributions represented 5 percent of the "basic wages or salaries," employers' shares were 14 percent, and government contributions were 2 percent (as transfers). Independent and self-employed workers' contributions were 15 percent of their reported monthly income (minimum and maximum income levels are established).

By law, all wage-earners or salaried employees from cooperatives and public or private enterprises have to be registered in the social security system. For independent workers, participation in the social security system is optional.

TABLE 2.6: **Peru: Contributions to the Social Security System, by Programs, 1983 (percentage of wages)**

Programs	Employees a/	Employers	Government	Self-Employed & Independent	Total b/
Pensions	2.5	5.0	1.0	7.5	8.5
Medical & Maternity	2.5	5.0	1.0	7.5	8.5
Professional Risk	-	4.0 c/	-	-	4.0
TOTAL	5.0	14.0	2.0	15.0	21.0

a/ Variable rates, with minimum and maximum contributions.
b/ Excluding independent workers.
c/ National average, rates range from 1 to 12.5 percent, depending on type of risk.

Source: From Cepal (1985) p. 328 and SAA (1985) p.56-57.

The medical and maternity programs provide coverage for the spouse, concubine, and children under one year of age. But, even the system's coverage for dependents is limited. Table 2.7 presents gross estimates of the coverage of the medical and maternal assistance social security programs.

Health services to those affiliated with IPSS is provided directly through IPSS's medical posts, clinics, and hospitals, and through contracts for services from private providers. For some groups of white-collar workers there is a "free-option" system by which medical care can be received from private practitioners or clinics. Reimbursement rates for health-related goods and services are established by IPSS.

As in most Latin American countries, health services for military personnel are separated from the rest of the social security system. Within the military, there are separate arrangements for the air force, navy, army, and the police; each has its own private hospitals, medical services, and programs.

TABLE 2.7: **Peru: Coverage of the Social Security System, 1961-83**
(millions)

Year	Total Population	Economically Active Population	IPSS Actives a/	IPSS Total b/	% of Total Population	% of Economically Active Population
1961	10.2	3.3	0.8	0.9	8.8	24.2
1965	11.5	3.7	1.2	1.3	11.3	32.4
1969	12.8	4.2	1.5	1.6	12.5	35.7
1975	15.2	4.9	1.7	2.3	15.3	34.7
1980	17.3	5.6	2.3	2.9	17.3	41.1
1981	17.7	5.8	2.4	3.1	17.4	41.4
1982	18.2	6.0	2.4	3.1	18.1	40.0
1983	18.7	6.2	2.5	3.2	18.7	40.3
1984	19.2	6.4	2.6	3.4	17.7	40.6
1985	19.7	6.8	2.7	5.2	26.3	39.7

a/ 1961-1969 coverage of pension program. Excludes fishermen and jockeys. 1975-1980 coverage of health programs including estimates of army and fishermen. From 1980 on, includes domestic workers, affiliated members (optional) and pensioners.

b/ 1961-1969 includes only spouses of white collar workers with maternity assistance. Since 1975, includes spouses or concubines and children less than one year old with access to the benefits. Inactive 1961-1969 includes white and blue collar workers in pension programs, since 1975 includes workers with professional risk coverage, excluding army, fishermen and jockeys.

Source: Elaborated from Cepal (1985) p.325-326 and INE (1986) pp.33, 66, 138.

The limited number of people served by the social security system in Peru is explained in part by the relatively low proportion of workers engaged in formal wage- or salary-stipulated contracts, by the relatively high cost of the contributions required of independent or self-employed workers who constitute a large segment of the workers in urban areas, and by the large proportion of workers who earn below the stipulated minimum wage used for calculating the minimum legal contributions. Finally, for workers in rural areas who form about 30 percent of the labor force, only workers of large cooperatives and SAID receive regular wages, and most of these cooperatives have their own medical posts or clinics for regular medical assistance. The large proportion of the rural population, however, is out of the scope of the social security system.

Combined data from Table 2.6 on the coverage of the medical assistance and maternity program and data from Table 2.5 on the IPSS budget show that between 1975 and 1982, total expenditures in these programs represented between 2.0 and 2.7 percent of GDP. In real terms, expenditures on these programs increased from about 85 millions in 1975 to nearly 120 millions in 1982. Expenditure per affiliate and dependent members, after a significant increase from US$106 in 1975 to US$136 in 1981, declined to about US$100 in 1982.

Although little is known about expenditures in the other corporate sectors, it is generally perceived that their services are better because members choose the services even when given the option of using the IPSS facilities or public health sector services. The "better" services can be attributed to higher per capita expenditures and to more efficient provision of resources. These hypotheses can be investigated to compare the cost of services among the various corporate health institutions and to identify ways of improving the efficiency of the system. Assuming that per capita expenditures in the other corporate health institutions are similar to that of IPSS, total expenditure of the corporate health sector would be about 15 percent higher than the public health sector, representing about 2.7 percent of GDP.

In summary, people covered by the social security system receive the equivalent of almost five times the medical care received by people in the public health sector programs. Part of the difference might be explained by the inclusion of prescriptions and materials provided by the social security and corporate institutions. Another explanation may be that social security provides a different type of health service than does the public health sector. Hospitals of corporate health institutions, especially those of the social security and the army, are known for having better and less crowded facilities and more modern equipment, which enables them to provide more sophisticated and expensive medical care.

2.5 Private Expenditures on Health-Related Goods and Services

Because services provided by the public and corporate health institutions are free, household expenditures for health-related goods and services could be used to estimate the amount of resources spent on privately produced health goods and services. In this section the results of household surveys are used to provide rough estimates of the magnitude of the private health sector.

The ECIEL (Programa de Estudios Conjuntos pare Integración Económica Latinoamericana) household survey on income and expenditure patterns in metropolitan Lima found that the average share of private expenditures on health-related goods and services, excluding contributions to social security and private medical insurance, represented about 2.2 percent of the household expenditure. Income elasticity of expenditures on health-related services estimated from the ECIEL survey was found to be less than one: 0.55 (Figueroa 1974).

Other findings from the ECIEL survey show an inverse relation between family size and share of expenditures on health-related services. A significantly higher share of health-related expenditures was found in households in which the head of household was more than 65 years old retired. A slightly higher share of health expenditures was found in households in which the head of household was "less educated." Also the survey showed that there was a marked seasonality for expenditure patterns, with higher expenditures during autumn and winter months (May-November), and that the number of children (under six) did not seem to affect health expenditure shares.

The National Household Consumption Survey (ENCA) of 1971-72 showed higher private medical expenditures. For metropolitan Lima, medical expenditures, including prescriptions and materials, represented on average 3.45 percent of the total household expenditure; both the lowest and highest expenditure shares were found in the higher income groups: from 2.52 to 4.50.

The National Multipurpose Household Survey (ENAPRON) of 1977-78 showed that for metropolitan Lima and twelve of the largest cities, the average share of expenditures on health-related goods and services was 2.54 percent of the total reported income. This survey showed the lowest and

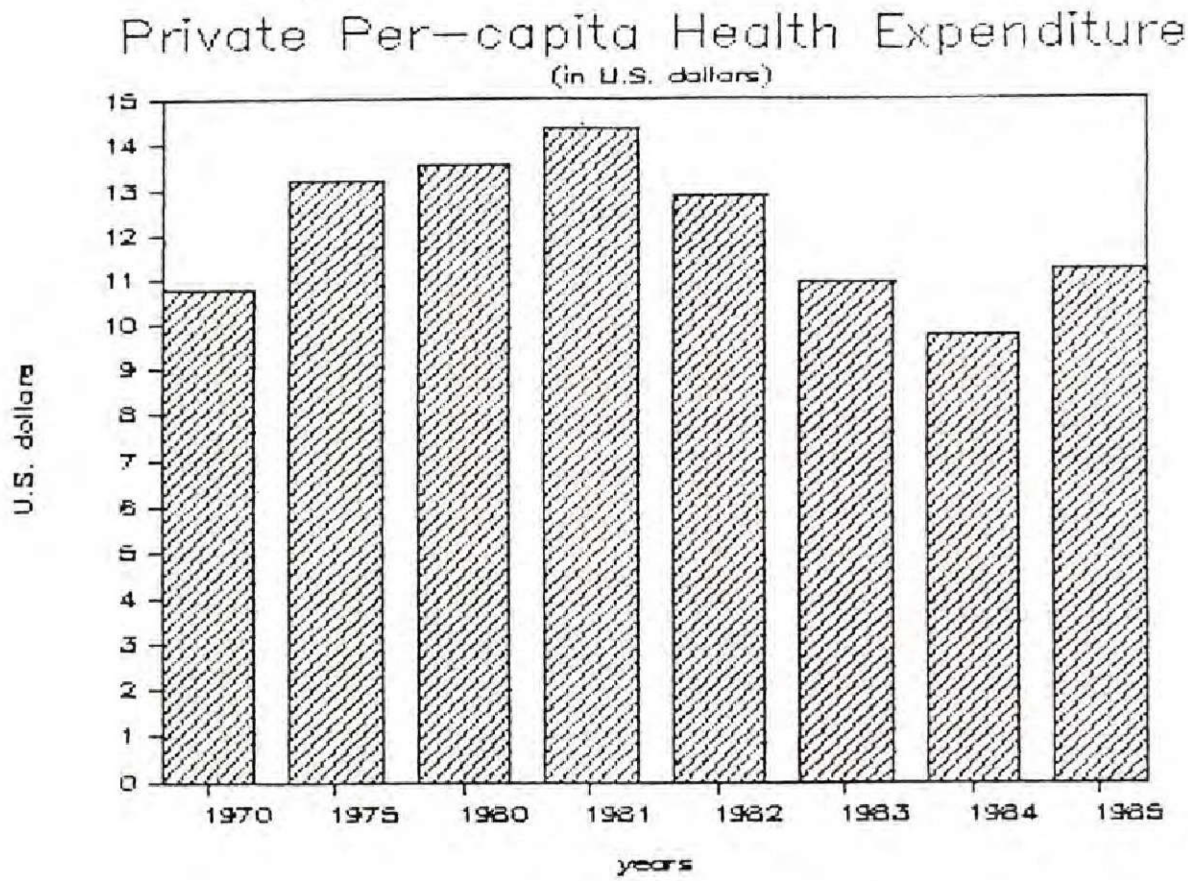
TABLE 2.8: **Peru: Per capita Income and Private Expenditure on Health, 1970-85**
(intis)

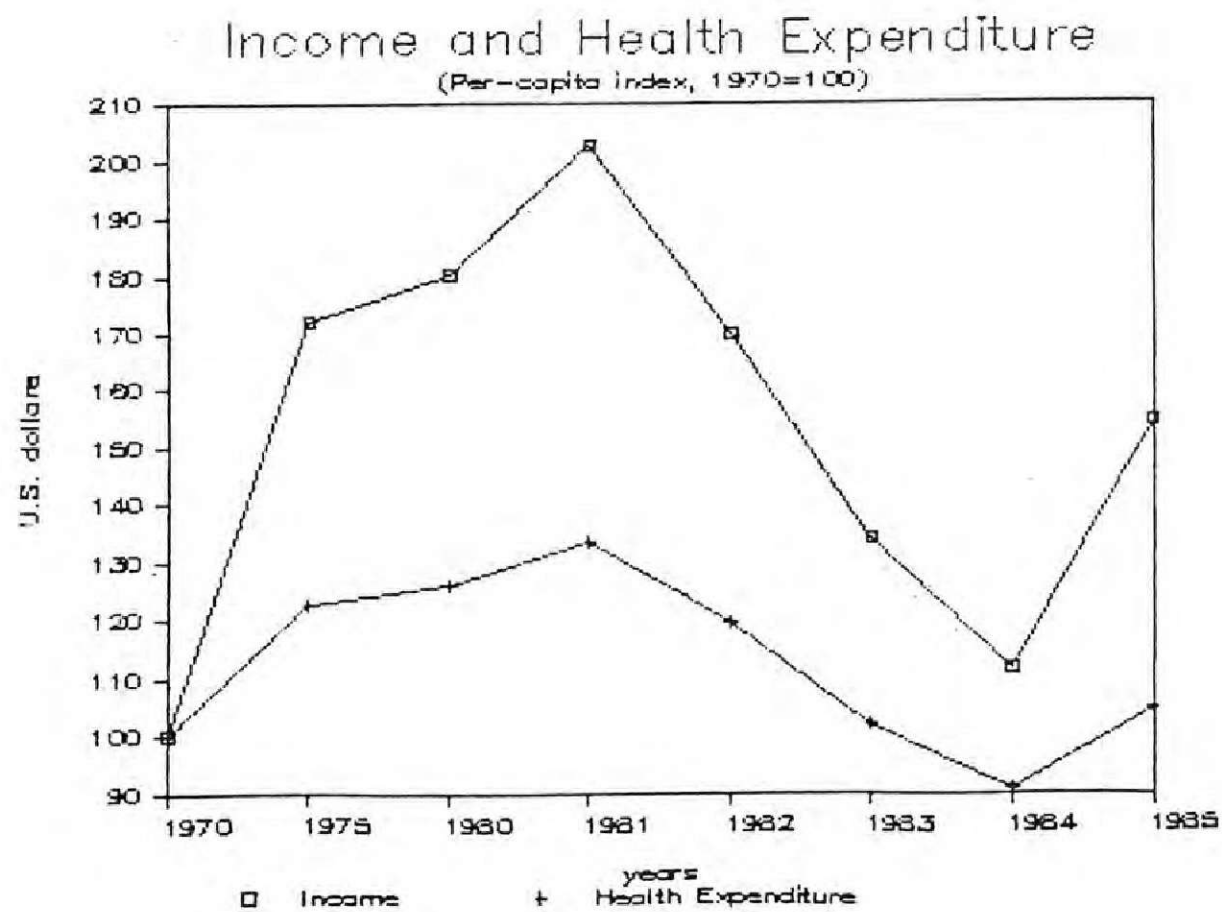
	1970	1975	1980	1981	1982	1983	1984	1985
GDP per capita								
(intis 000' real)	262.9	290.9	299.3	301.3	296.4	252.1	256.0	254.2
Index GDP per capita	100.0	110.7	113.9	114.6	112.8	95.9	97.4	96.7
GDP, per capita (US$)	485.9	837.4	875.9	985.1	826.6	651.8	542.3	751.0
Index, 1970=100	100.0	172.3	180.3	202.7	170.1	134.1	111.6	154.6
Private Expenditure in								
Health (per capita)								
Hypothesis A (ENCA) ($)	9.1	9.6	9.8	9.8	9.7	8.9	8.9	8.9
Hypothesis B (ECIEL) ($)	5.8	6.2	6.3	6.3	6.2	5.7	5.7	5.7
Index, 1970=100	100.0	105.9	107.6	108.0	107.0	97.7	98.6	98.2
In US $								
Hypothesis A (ENCA)	16.8	21.0	21.5	22.8	20.9	18.8	17.5	20.0
Hypothesis B (ECIEL)	10.7	15.0	15.5	16.8	14.9	12.8	11.4	14.0
Index, 1970=100	100.0	139.8	144.1	156.5	138.6	118.8	106.4	130.0
Share from Income ($)								
Hypothesis A (ENCA)	3.5	3.3	3.3	3.3	3.3	3.5	3.5	3.5
Hypothesis B (ECIEL)	2.2	2.1	2.1	2.1	2.1	2.3	2.2	2.2

highest expenditure shares to be in the middle-income groups, with expenditure shares ranging from 1.86 to 2.83 percent (see CEPAL 1984).

A survey on economic activities conducted between 1978 and 1979 in eight Andean rural communities in the south of Peru, the poorest region, found that expenditures on health-related services, medicine, and materials represented an average of 2.42 percent of the total monetary exports. 10/

Using data from the ECIEL and ENCA surveys on expenditure shares and income elasticity, changes in total and per capita private expenditures on health between 1970 and 1985 were estimated (see Table 2.8). Expenditure shares and income elasticity were used to estimate average household


Private Per-capita Health Expenditure
(in U.S. dollars)
U.S. dollars
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
1970
1975
1980
1981
1982
1983
1984
1985
years


Income and Health Expenditure
(Per-capita index, 1970=100)
U.S. dollars
210
200
190
180
170
160
150
140
130
120
110
100
90
1970
1975
1980
1981
1982
1983
1984
1985
years
Income
Health Expenditure

expenditure on private health-related goods and services. The results presented under Hypothesis A were derived using the ENCA estimates of average expenditures for 1970; results for the remaining years were derived using the income elasticity value obtained from the ECIEL survey. Estimates based on the ECIEL survey (Hypothesis B) produced the lowest per capita expenditure rates. These can be taken as the low benchmark estimates that show average individual household expenditures on private health-related goods and services. An implicit assumption of these estimates is that no changes in the structure of relative prices in the economy has occurred; that is, the relation between prices of health services and other commodities has remained constant. In general, however, the estimates are rough and thus should be studied with caution. 11/

Data from Table 2.8 show that as per capita income fell from its 1981 peak, private expenditures on health goods and services also declined. In 1985 per capita expenditures in real terms was approximately 2 percent less than expenditures in 1970 and 10 percent less than the highest level, US$22, attained in 1981 (see index 1970 = 100.0). Since 1981 health expenditures have declined continually from between US$17 and US$23 in 1981 to between US$14.0 and US$20.0 in 1985.

Adding expenditures on health-related goods and services and the public, corporate, and household expenditures on private health-related goods and services provides the estimate of the total amount of resources devoted to health.

Table 2.9 summarizes indicators of the relative importance of each of these sectors by coverage and expenditure.

TABLE 2.9: **Peru: Summary Results, Composition of the Health Sector (around 1980-84)**

Sectors	Coverage	Expenditure US$ per capita	Total Expenditure % of the GDP	Sectorial Share (%)
PHS	56.5	10 to 17	0.6 - 0.8	~ 10
CHS	16.6	100 to 130	2.3 3.1	~ 45
PS	?	11 to 20	2.1 - 3.5	~ 45
TOTAL	100.0	55 to 77	5.0 - 7.0	100

Although most policy debates on financing health programs concentrate on financing the public health sector, this sector's expenditures represent only about 10 percent of total health expenditures. Expenditures of the corporate health sector and private households on health-related goods and services represent about 90 percent of total expenditures. These results show a further need to explore the role that the corporate and private sectors could have in implementing health programs.

3. HEALTH INDICATORS: DISTRIBUTION OF MANPOWER AND FACILITIES

3.1 Health Status: Morbidity and Mortality Rates

The main indicators of the health status of the Peruvian population are presented in Table 3.1. This table summarizes the evolving pattern of the mortality, life expectancy, and infant mortality rates from selected years from the fifties to 1986. In 1986 average life expectancy at birth is estimated at 60.8 years, which is below the average life expectancy rate of 61.2 years for other Latin American countries and the average of 71 years for the developed countries (from 1970-75 estimates).

TABLE 3.1: **Peru: Evolution of Health Status Indicators, Selected Periods**
(per thousand)

1950-55	1975	1980-85		1986
Crude Birth Rate	47.0	39.4	37.0	35.0
Crude Mortality Rate	21.6	12.2	11.7	9.7
Infant Mortality Rate a/	156.0	106.6	99.0	90.5
Fertility Rate b/		5.6	4.9	4.7
Life Expectancy at Birth	44.1	56.5	58.9	60.8

a/ Live birth, up to one year.
b/ Per woman in child bearing age.

Source: Elaborated from INE (1986, 1986c) and Ministry of Health (1986).

As in most developing countries, the evolution of the life expectancy rate shows that after a significant increase in the life expectancy rate during the fifties and sixties, the rate of increase leveled off during the last decade. Cumulative increases in the life expectancy rates declined from 13 percent between 1960 and 1970 to less than 5 percent during the last ten years (1975-85). For developed countries the life expectancy rate leveled only after it reached 70 years. 12/

Data also show that whereas both birth and mortality rates have been declining, infant mortality remains high, which is the most important factor explaining the relatively low life expectancy and still high crude mortality rates.

Peru's infant mortality rate (infants born alive and living to one year) is about 90 per thousand; it is one of the highest among Latin American countries and is in sharp contrast to the infant mortality rates of the most developed countries, whose rates range from 10 to 20 per thousand. Estimates of the death rate by age group show that, in 1964, about one-third of registered deaths were of infants. More than 50 percent of deaths were children under five years. Table 3.2 presents 1981 estimates of percentages of deaths by age and gender. Comparing these figures with those for 1964 suggests that although important gains have been made in reducing infant mortality, this group still accounts for almost one-fourth of total registered deaths; the under five years age groups account for about 36.5 percent of total registered deaths. 13/

Table 3.2 shows that no major difference exists in the proportion of deaths in each age group by gender. For both male and female groups, more than one-third of deaths are children under five years. The proportion of deaths remains between 4.1 and 4.5 up to the 45-54 years group; thereafter it starts to increase by age.

TABLE 3.2: **Peru: Percentage of Deaths by Age and Sex Groups, 1981**

Age Group	Total	Male	Female
0 to 1	23.2	24.3	22.0
1 to 4	13.3	12.7	14.0
5 to 14	4.1	4.1	4.0
15 to 24	4.5	4.8	4.2
25 to 34	4.3	4.5	4.1
35 to 44	4.5	4.5	4.5
45 to 54	5.5	5.9	5.1
55 to 64	6.8	7.4	6.2
65 to 74	8.8	9.2	8.4
74 and more	17.7	15.1	20.4
Not specified	7.3	7.5	7.1
TOTAL	100.0	100.0	100.0

Source: Elaborated from WHO (1985), Table 13.

Table 3.3 and 3.4 summarize morbidity cases and mortality rates by type of illness for selected periods. 14/

The data for 1980-84 show that per 100,000 people, an average of 803 cases of illness were reported. About one-third of the reported cases were intestinal parasitic diseases. Dysentery, parasitosis, and other infectious diseases, including typhoid fever and typhoid-related diseases, represented more than 50 percent of the reported cases per 100,000 inhabitants. Also, although some improvements have been made in reducing the incidence of tuberculosis, tuberculosis and malaria cases are still high. The pattern in the incidences of malaria shows that from the fifties to the early sixties cases of malaria declined from 209.8 per 100,000 population to 19.3. During the early sixties, reported malaria cases declined to less than 2,000; in 1976 malaria increased to 4,000 cases, and in 1977 to 32,000 cases. At the beginning of the eighties, reported cases declined to 14,000, but in 1983 it again increased to 28,000 and in 1984 the figure was 26,000, averaging 135.9 cases per 100,000 people.

Data in Table 3.3 are reported cases of an illness. Although some of the variation over the various periods can be attributed to early under-reporting of an illness, there are no trends that indicate under-reporting to be the major cause of the differences.

TABLE 3.3: **Peru: Morbidity, Reported Cases by type of Illness Selected Periods and Last Available Year (rate per 100,000)**

Type of Illness	1950-55	1960-65	1970-75	1980-84	1984
Typhoid and Related		52.9	50.2	117.0	86.7
Dysentery		188.3	173.9	37.5	33.3
Infectious Hepatitis		25.8	32.3	31.8	35.9
Parasitosis		100.4	125.1	233.3	234.7
Tuberculosis	213.4	235.4	145.7	137.7	113.1
Malaria	209.8	19.3	66.7	114.2	135.9
Poliomyelitis a/		1.5	0.9	1.7	0.9
Measles (Sarampion) a/		82.9	59.6	72.7	85.0
Diphtheria a/		0.5	0.5	0.9	0.8
Tetanus a/		2.4	2.3	2.3	2.3
Tosferina a/		101.7	83.6	54.0	48.7

a/ Corresponds to 1968-70.

Source: Elaborated from Ministry of Health (1986), Tables 3 to 6.

TABLE 3.4: **Peru: Principal Causes of Death, 1981**

Causes of Death	Total	Male	Female
Infectious and Parasitic Diseases	19.3	19.4	19.1
Tuberculosis	3.9	4.3	3.4
Malignant Neoplasms	6.8	5.9	7.7
Circulatory System	11.9	11.2	12.6
Pneumonia	14.4	13.9	14.9
Bronchitis, Emphysema and Asthma	3.2	3.1	3.3
Digestive System	3.6	3.9	3.2
Perinatal Condition	8.5	9.1	7.8
Injury and Poisoning	6.9	8.1	3.3
Other	21.5	20.9	24.6
TOTAL	100.0	100.0	100.0

Source: Elaborated from WHO (1985), Table 13.

Vaccination programs have not significantly reduced the incidences of diseases such as measles, polio, tetanus, and diptheria. Reported cases of polio, measles, and diptheria per 100,000 persons almost doubled from the 1970-75 period to the 1980-84 period. With the exception of tosferina, dysentery, and hepatitis, the number of cases for all the illnesses that can be controlled by immunization programs almost doubled.

Table 3.4 presents data on causes of death by gender and type of illness. These data are consistent with morbidity patterns presented in Table 3.3. Infectious and parasitic diseases, other intestinal infections, and pneumonia are the main causes of death in both men and women and represent about 42 percent of the total registered deaths.

About 70 percent of these cases are deaths of children under age five years. Pneumonia is the cause of 46 percent of deaths in this age group. Perinatal mortality accounts for 8 percent of total deaths. Table 3.4 shows little difference in mortality patterns by gender. Although there are some minor variations in the number of deaths for each disease, the same group of illness is responsible for about 80 percent of the registered deaths.

The high incidences of infectious parasitic diseases, and other intestinal infections like dysentery, the morbidity and mortality patterns, and the age profiles of morbidity and mortality reveal that infant and child mortality is the most critical health problem in Peru. Most of these types of illnesses are related to lack of sanitation, inadequate waste disposal, and inaccessibility of safe drinking water.

The general goal of a health program is to reduce morbidity and mortality rates. The above patterns suggest that the major causes of morbidity and mortality are environmental-related diseases; therefore, health programs should emphasize preventative measures that address this problem.

This objective requires the allocation of health resources for both preventative and curative services. Available information suggests that concentrating resources on curative services might be inadequate. But without a proper knowledge of the relative costs of preventative and curative services, it is difficult to assess the inadequacies of resource allocation. Further work is needed in this area. 15/

Another issue is the role of the market mechanism in providing the necessary preventative health services that fall within the typical classification of public goods. Although individual efforts can be made to solve the sanitation and environmental problems, an effective solution requires a broader based community effort.

3.2 Coverage and Coverage-Related Indicators

Adequate housing, access to safe drinking water, and appropriate waste disposal are often cited as preconditions for reducing infectious parasitic diseases, which in developing countries like Peru are among the main causes of illness among adults and death in children under five years. Inadequate housing and sanitary conditions adversely affect curative health programs and result in the persistence and spread of communicable diseases.16/ Table 3.5 presents data on the Peruvian population's access to adequate water supply and excretal disposal facilities.

TABLE 3.5: **Peru: Housing and Population by Type of Services, 1981**

Type of Services	TOTAL	Total	Water, Sewer. and Electric.	Water and Sewerage	Water and Electricity	Only Water	Only Electricity	Without Services
TOTAL	3257.1	1659.2	915.6	66.3	153.4	102.8	421.1	1597.9
Percentages	100.0	50.9	28.1	2.0	4.7	3.2	12.9	49.1
Population a/	1775.6	9044.2	4990.7	361.6	836.4	560.2	2295.2	8710.3

Notes a/ Population by type of service has been estimated using the national average of 5.451 persons per house.

Source Elaborated from INE (1986c), p.79.

The data in this table show that only one-half of the total inhabited houses had some type of services: water excretal disposal electricity. The proportion of houses with the three types of services was only 28 percent. The proportion of houses with both water and sewage disposal systems was only 30 percent, while the proportion of population with access to safe drinking water was a little higher, 38 percent. Data on the population living in other housing conditions are not readily available. The figures in Table 3.5 assume a constant number of members per dwelling (the national average of 5.4) and should be taken cautiously. By using the national average, distribution of the population classified as having access to the different types of services will be similar to the distribution of houses.

Limited access to safe drinking water and adequate excretal disposal facilities is more acute in rural areas. Also important disparities exist among the various regions (see Section 3.3).

WHO researchers compiled data for a group of specific preventative and curative primary health services included in the "Health for All by the Year 2000" program. 17/ Coverage was defined as the ratio of population receiving certain types of services to the population in need of these services. [18/] Table 3.6 presents data on the coverage of various health-related services.

One-hundred-percent coverage is one of the goals of WHO's Health for All by the Year 2000 Plan. The above data show several areas in which Peru is still far from these goals. Access to medical services is often measured by the ratio of population to various types of health personnel. Indicators of

TABLE 3.6: **Peru: Coverage and Coverage Related Indicators in Peru**

% Coverage with	
Antenatal Care	59
Attendance of Delivery	43
Child Care	
Vaccination	65
Vaccination with Third Dose	24
Endemic Disease	
AT (?)	37*
Activity to Population Ratio, as %	
Consultations	40
Hospitalization	54

(?) Rough estimate based on partial information.
* Data for years prior to 1978.

Source: Montoya-Aguilar, C. (1985), p.2.

health manpower resources show that Peru is not far from the minimum standards set by WHO. The ratio of population to medical personnel in Peru is about 1300 persons per physician and 2,400 persons per nurse; minimum goals set by WHO are 1,250 per physician and 2,220 per nurse.

The above indicators are not only guidelines for establishing priorities, they are also essential for designing policy objectives and programming optimal allocations of resources among the various health programs according to specific objective functions. These functions, defined as quantitative goals, coverage goals, and estimates of the relative costs of the various preventative and curative health services, are essential for achieving optimal allocation of resources, particularly in a context of limited financial and human resources. 19/ To the extent known, such procedures are not incorporated into the health planning process in Peru; instead, the process involves basic programs, with the general objective of universal coverage and loosely defined quantitative goals.

3.3 Poverty, Coverage, and Regional Disparities

Aggregate average indicators say little about the distribution of personnel and facilities or their availability to different social groups. Table 3.7 presents data showing disparities in the distribution of housing services, hospital beds, and health personnel among the various political departments. Data show that across departments there are large variations in the proportion of houses with different types of services and in the ratios of population to health personnel. In Lima and Callao more than 80 percent of the houses have at least some type of basic service, that is, water, sewer electricity. In the poorest department of the Sierra, the proportion of houses with some of the services ranged from a high of 22 percent in Ayacucho to around 15 percent in Amazonas, Apurimac, Cajamarca, and Puno and 12 percent in Huancavelica.

Regional average ratios of population per medical personnel also vary greatly. Although national averages of population per hospital bed and per physician are 500 and 1,300 respectively, the ratio population/hospital beds is only 200 for Callao and about 300 for Arequipa, Lima, Moquegua, and Tacna. But in the poorest departments, the ratios are at least five times higher for Ayacucho, San Martin, and Apurimac; between five and seven times higher for Huancavelica, Puno, and Amazonas; and more than ten times higher for Cajamarca. A more skewed distribution exists for doctors; while Lima and Callao enjoy an average of about 500 persons per doctor, the ratio increases to almost 18,000 persons per doctor in Ayacucho and Cajamarca, 25,000 persons per doctor in Cajamarca, and more than 31,000 persons per doctor in Huancavelica and Amazonas.

TABLE 3.7: **Peru: Social Security Coverage, Regional Disparities, (thousands)**

Department	Total Population a/	Average Income	Insured b/	(%) Coverage
Lima	4,746	100.0	1,256	26.7
Callao	443	100.0	109	24.6
Ica	434	73.1	89	20.5
Tacna	143	87.0	28	19.6
Arequipa	706	63.6	123	17.4
Lambayeque	674	63.8	101	15.0
Moquegua	101	90.0	14	13.9
Pasco	213	59.1	28	13.1
La Libertad	963	65.0	116	12.0
Ancash	818	54.3	80	9.8
Junin	852	58.5	81	9.5
Tumbes	104	75.9	9	8.6
Loreto	445	70.1	38	8.5
Piura	1,126	65.4	94	8.3
Ucayali	201	66.2	15	7.5
Madre de Dios	33	75.9	2	6.1
San Martin	320	45.9	16	5.0
Cuzco	832	48.6	39	4.7
Huanco	485	50.9	23	4.7
Huancavelica	347	38.6	13	3.7
Puno	890	41.7	33	3.7
Amazonas	255	42.7	8	3.1
Ayacucho	503	40.9	14	2.8
Cajamarca	1,046	39.1	28	2.7
Apurimac	323	40.7	8	2.5
TOTAL	17,005		2,374	14.0

a/ Census enumerated population. Excludes omitted and jungle populations (estimated at 762,226).

b/ Medical attention and maternity programs. Army not included.

c/ Average income of Lima index: Intis 74.88=100.0.

Source: Elaborated from: INE (1983); Cepal (1985), p.327; BCR (1984); BCR (1984), p.44-45.

Because only about one-third of the physicians and about 11 percent of the dentists work through MOH, distribution of health personnel across the country seems to be only marginally determined by MOH allocations. 20/

Measures of inequality in the spatial distribution of health care resources and sanitation services have been estimated and reported in a study of the Central Bank of Peru (BCR 1984). Gini coefficients have been estimated for the distribution of houses with water and houses with sewers, and for the distribution of the population according to health care and sanitation services, Gini coefficients ranged from 0.32 for the distribution of dwellings with water to 0.51 (highest inequality) for the distribution of doctors. Second in inequality was the distribution of dwellings with sewerage (see Appendix Table A.4.1).

Estimates on the coverage of the social security system by departments clearly show a positive correlation between average income of the department and level of coverage; that is, coastal departments with high urbanization and per capita income have the highest coverage. Social security coverage is more limited in departments in the poorest regions of Peru--those south of the Sierra with the larger proportion of the rural population. This is not surprising given the process by which the social security system was created in Peru.

The data on the distribution of services provided by MOH and IPSS show that the number of doctor consultations per capita varied from less than 0.2 in the departments of Amazonas, Apurimac, and Huancavelica to more than 1.5 in Lima, Callao, and Ica. A similar pattern was found in the distribution of the number of per capita dentist consultations. A high correlation (0.82) was found between the number of hospital beds per capita and the number of hospital "egresses." The only variable that had a different pattern was the distribution of health care per capita per health or auxiliary personnel. In general, expensive resources seem to be more concentrated than cheaper ones (doctors versus nurses, and sewerage versus water supply). 21/

A health map of Peru was constructed by choosing a set of variables using a rank correlation coefficient criteria; that is, variables with correlations between 60 and 90 percent were chosen as indicators to organize a ranking of departments according to health status of the population, sanitation, availability of health personnel, extent of coverage of health programs, and accessibility of health services. Of the three groups of departments ranked, the group with the poorest health indicators comprised eight departments from the high mountains (Sierra): Apurimac, Puno, Ayacucho, Cajamarca, Amazonas, Cusco, Huancavelica, and Huanuco. These departments had the highest deficits of health resources and services and the lowest coverage of health programs. They represented about 28 percent of the population and had high illiteracy rates. They were also predominantly agricultural economies, with incomes well below the national average and high migration rates. The group with the highest health indicators and the highest coverage of health programs and availability of health facilities were the rich coastal departments of La Libertad, Arequipa, Lambayeque, Lima, Callao, Ica, Tacna, and Moquegua. The BCR study found that the distribution of health resources across the various regions of the country had a pattern similar to the distribution of productive activities. The study also stated that some improvements in coverage could be obtained by eliminating access barriers to some of the facilities of corporate health institutions.

Indicators of distribution patterns of health resources, particularly of health personnel and health facilities, still have several shortcomings. They hide an important source of inequality derived from the method of calculation, which assumes that all resources, including those with restricted access, are available to the general public. In addition, it is assumed that needs or incidences of illness are uniformly distributed across regions and among the population groups and that existing facilities or resources correspond to population needs.

Some of these issues have been addressed in data from the 1984 National Health and Nutrition Survey (ENNSA) and in studies by the National Health Sector Analysis Group (ANSSA), and ad hoc research groups formed to analyze the data from this survey. 22/ The results from ENNSA reported by the National Institute for Statistics (INE) (1986) show that the proportion of the population involved in accidents or having symptoms of disease was inversely related to level of income and education. A larger proportion of the poor and lower educated population reported having symptoms of illness. As the level of education and income increases, the proportion of the population with symptoms of illness or accidents declines.

The proportion of the population with symptoms of diseases seeking professional medical attention was positively related to both education and income. Demand for traditional healers and auxiliary health personnel (lower level health personnel) was inversely related to income levels.

ENNSA results on the prevalence and types of diseases and the distribution of population with symptoms seeking health care by age groups are consistent with morbidity and mortality patterns presented in Section 3.1. There are high incidences of parasitic infections and respiratory diseases. Although the prevalence of symptoms was relatively evenly distributed across political and ecological regions and rural and urban areas, distribution of population with symptoms seeking medical attention was higher in coastal regions and urban areas. The unconditional probability of seeking some type of medical care ranged from 15 percent in Lima to less than 5 percent in the rural mountains of Sierra (see Table 3.7).

4. SUMMARY AND CONCLUSIONS

To analyze the financing of the health sector, Peruvian health institutions were classified into three groups: (1) the public health sector, which provides free services to the general public; (2) the corporate health sector, which restricts services to affiliated members; and (3) the private health sector, which provides services through explicit price-rationing schemes.

The central government is the main source of financing for the Ministry of Health (MOH), the main institution of the public health sector. The resources devoted to MOH as a percentage of the government budget declined from 6.4 percent in 1970 to around 4.5 during the last ten years. As a proportion of GDP, government expenditure in health declined from 1.2 percent during the seventies to 0.6 in 1985. Per capita public expenditure on health declined from a high of US$9.0 during 1980-81 to less than US$5 during the last two years.

The data presented in this paper (Table 2.8) show that while coverage by the public health sector is relatively high, the proportion of financial resources represents only 10 percent of the total resources spent in health-related goods and services. Expenditures of the corporate and private health sectors represent about 90 percent of total sectorial expenditures. This result calls for further studies to explore the roles that the corporate and private sectors can play in implementing health programs.

While mortality rate has been declining infant mortaly rate remains high: around 90 per thousand (compare with between 10 to 20 per thousand in developed nations). Infections parasitic diseases, pneumonia, and other environmental related diseases appear as the main causes of morbility and mortality rates. With the exception of tosferina (whooping cough) incidence of illness that can be controlled by immunization programs almost double.

Prevalence of environmental related diseases and high incidence of illness that could be prevented by vaccination suggest that concentration of Peruvian health institutions in the production of curative services rather than in preventive actions might be indicating a gross misallocation of resources spent in health. It also implies that there is a limited scope of the market mechanisms in alleviating the major causes of observed morbidity and mortality patterns. Further analysis of these issues is needed.

Health related indicators also show that there is a high degree of inequality in the spatial distribution of health physical facilities, health personnel and sanitation services. Furthermore, there seen to be a higher degree of concentration of relatively more expensive resources.

TABLE A.2.1: **Peru: Ministry of Health, Actual Revenues by Sources, 1980-84**
(%)

Sources	1980	1981	1982	1983	1984
Central Government	88.9	90.7	88.5	88.2	86.7
Revenues	6.7	6.2	8.2	7.1	7.2
Borrowing	4.0	2.8	1.5	2.8	4.6
Transfers	0.3	0.2	1.8	1.9	1.5
TOTAL	100.0	100.0	100.0	100.0	100.0
Actual budget (billions of soles:					
Current	49.0	83.2	166.3	341.5	725.6
Constant, 1980)	49.0	50.7	61.5	58.1	58.0

Source: ANNSA (1985), pp.96-97.

TABLE A.2.2: **Peru: IPSS, Covered Population: Active and Dependents, 1980-85**
(thousands)

Covered Population	1980	1981	1982	1983	1984	1985
Active a/	2272.2	2373.9	2390.0	2497.6	2611.0	5242.5
Dependent						
Spouses	620.0	649.5	676.9	705.3	734.5	765.2
Children	45.2	47.2	49.2	51.2	53.2	1761.9

a/ Active members: white collar, blue collar, domestic workers, affiliated members and pensioners.

Source: INE (1986), p.66.

TABLE A.3.1: Peru: Measures Related to Equity in Health Care, 1982
Health Care Resources and Sanitation Services
(%)

Department	Population	Resources			Dwellings		
		Doctors	Nurses	Hospital Beds	Total	With Water	With Sewerage
Amazonas	1.5	0.0	0.1	0.3	2.4	0.6	0.4
Ancash	4.8	1.2	3.4	2.7	5.1	4.5	3.7
Apurimac	1.9	0.1	0.5	0.7	2.2	0.5	0.2
Arequipa	4.2	5.3	8.2	6.8	4.3	5.7	6.0
Ayacucho	2.9	0.2	1.3	0.9	2.6	1.5	0.7
Cajamarca	6.1	0.5	0.6	0.9	6.3	2.0	1.4
Callao	2.7	6.3	4.5	4.9	2.3	4.4	5.3
Cuzco	4.9	1.0	2.2	2.9	5.4	2.6	2.1
Huancavelica	2.0	0.1	0.4	0.7	2.4	0.6	0.4
Huanuco	2.8	0.6	0.6	1.5	2.9	1.0	0.9
Ica	2.5	2.8	3.8	3.7	2.5	3.1	2.4
Junin	5.0	1.5	4.0	4.5	5.3	4.3	3.1
La Libertad	5.6	4.9	5.5	4.9	5.5	6.5	6.1
Lambayeque	4.0	2.6	5.4	3.8	3.5	4.5	4.3
Lima	28.1	66.6	50.7	48.4	26.4	45.1	52.8
Loreto	2.6	0.8	0.7	1.5	2.2	2.0	1.8
Madre de Dios	0.2	0.1	0.1	0.2	0.2	0.0	0.1
Moquegua	0.6	0.7	0.2	1.1	0.2	0.7	0.7
Pasco	1.2	0.6	1.2	1.7	1.3	0.8	0.6
Piura	6.6	2.3	2.7	3.2	6.1	5.2	4.2
Puno	5.2	0.5	1.5	1.6	6.4	1.5	0.8
San Martin	1.9	0.2	0.5	0.8	1.7	0.9	0.3
Tacna	0.9	0.6	1.3	1.4	0.9	1.5	1.4
Tumbes	0.6	0.2	0.3	0.3	0.5	0.1	0.1
Ucayali	1.2	0.3	0.3	0.6	1.0	0.4	0.3
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Gini Coefficient of Inequality	-	0.51	0.38	0.34	-	0.32	0.41

Source: Banco Central de Reserva del Perú, Mapa de Salud del Perú, Lima: December 1984. Graphs 1-5, pp.19, 20, 23, 24 and 29, from Musgrove, P. (1986).

TABLE A.3.2: Peru: **Measures Related to Equity in Health Care, 1984: Morbidity and Medical Attention**

Department	Prevalance (%) of Symptoms				Percent Seeking Medical Attention			
	All Kinds	Respiratory Disease	Parasite Infection	In Total	Given Presence of Symptoms All Ages	I Year	1-4 Yrs.	5 Yrs.
Coast 34.89	16.11	0.21	12.67	30.86	51.41	30.68	28.64	
Urban 34.87	16.34	0.20	13.36	31.54	55.74	32.69	29.96	
Lima 36.57	17.68	0.15	14.88	33.49	59.43	35.87	31.62	
Slums	37.32	16.85	0.19	14.14	32.05	64.84	32.85	29.78
Rural 35.00	14.38	0.28	7.50	18.76	27.14	16.52	18.71	
Mountains	30.05	11.95	0.16	5.53	15.89	24.13	15.47	15.49
Urban 21.50	9.88	0.11	7.38	28.20	41.33	25.63	28.09	
Rural 33.75	12.84	0.18	4.73	12.49	19.32	12.33	12.10	
Jungle 36.03	12.06	1.78	7.65	18.39	27.33	17.20	17.94	
Urban 33.72	11.59	1.36	10.36	25.59	42.63	22.34	24.97	
Rural 37.35	12.32	2.02	6.11	14.69	18.42	14.46	14.41	
National Total	33.31	14.20	0.36	9.60	24.18	38.89	23.83	23.35
Urban 32.51	14.93	0.26	12.15	30.77	52.64	30.90	29.46	
Rural 34.62	13.01	0.53	5.45	14.01	20.55	13.51	13.69	

Source: Encuesta Nacional de Nutrición y Salud (National Health and Nutrition Survey), Peru, 1984. Tables 2.1, 2.2, 2.2A and 2.13 produced by the Instituto Nacional de Estadística, September 1985, unpublished, from Musgrove, P. (1986).

TABLE A.4.1: **Peru: Regional Disparities, selected Health Indicators, 1981**
(%)

	Percentage of Houses with Type of Services									Thousand of People Per			
Department	TOTAL	Total	Water, Sewer. & Elec.	Water and Sewer.	Water and Elec.	Only Water	Only Elec.	Without Services	Persons Per House	Hospital Bed	Physician	Nurse	Dentist
Amazonas	100.0	17.8	5.0	1.9	2.0	6.8	2.1	82.2	5.7	2.2	25.0	24.7	10.2
Ancash	100.0	38.7	24.9	6.7	1.0	0.7	5.4	61.3	5.2	0.7	5.2	3.5	21.7
Apurimac	100.0	17.4	2.3	1.0	5.5	6.6	1.9	82.6	4.8	1.6	31.3	11.1	29.4
Arequipa	100.0	68.7	36.0	2.9	8.8	2.3	18.6	31.3	5.4	0.3	1.0	1.3	3.6
Ayacucho	100.0	23.0	4.9	0.6	1.7	5.3	10.5	77.0	4.6	1.5	17.9	5.8	25.0
Cajamarca	100.0	15.8	7.0	3.2	0.2	0.2	5.2	84.2	5.4	3.3	17.9	27.8	29.4
Callao	100.0	90.3	64.4	1.2	4.9	1.0	18.9	9.7	5.9	0.2	0.5	1.4	2.0
Cuzco	100.0	27.3	9.7	1.0	3.4	4.1	9.2	72.7	5.0	0.8	6.0	5.6	7.6
Huancavelica	100.0	12.5	2.6	0.7	4.0	2.6	2.6	87.5	4.6	1.7	31.3	11.7	35.7
Huanuco	100.0	18.4	6.4	3.2	0.8	1.6	6.4	81.6	5.4	1.2	5.7	11.7	16.1
Ica	100.0	65.6	28.3	1.5	11.6	8.0	16.1	34.4	5.7	0.4	1.1	3.0	2.2
Junin	100.0	49.5	16.0	1.5	4.1	5.2	22.7	50.5	5.2	0.6	4.0	2.6	7.9
La Libertad	100.0	52.8	28.4	3.4	7.2	6.1	7.5	47.2	5.5	0.6	1.5	1.8	7.1
Lambayeque	100.0	59.2	31.9	3.1	6.9	6.1	11.3	40.8	6.2	0.5	1.9	1.4	6.7
Lima	100.0	85.2	56.4	1.3	5.5	1.7	20.4	14.8	5.7	0.3	0.5	1.4	2.0
Loreto	100.0	41.5	20.8	0.9	7.9	2.8	9.1	58.5	6.9	0.4	3.7	9.3	6.8
Madre de Dios	100.0	34.0	5.6	0.4	5.9	0.5	21.5	66.0	6.9	0.7	3.7	4.5	11.1
Moquegua	100.0	62.3	31.8	0.6	5.2	1.7	23.0	37.7	4.8	0.3	1.1	5.6	3.2
Pasco	100.0	46.5	12.0	0.7	7.6	4.1	22.1	53.5	5.5	0.4	2.7	2.6	9.3
Piura	100.0	37.8	17.8	2.2	5.3	7.6	4.9	62.2	5.9	1.0	3.7	6.0	11.6
Puno	100.0	14.8	7.6	2.6	0.4	0.7	3.5	85.2	4.4	1.9	12.5	8.5	50.0
San Martin	100.0	36.2	5.7	0.6	13.9	2.8	13.1	63.8	6.0	1.5	10.4	8.9	15.2
Tacna	100.0	77.3	46.7	1.9	10.0	7.0	11.6	22.7	5.3	0.3	1.8	1.7	4.5
Tumbes	100.0	86.6	7.3	0.4	2.6	0.6	75.7	13.4	6.4	0.9	5.4	4.9	6.7
Ucayali	100.0	27.4	5.3	0.3	4.8	1.1	16.0	72.6	6.7	1.0	6.6	8.2	13.5
TOTAL	100.0	50.9	28.1	2.0	4.7	3.2	12.9	49.1	5.5	0.5	1.3	2.4	4.3

Source: Elaborated from census data reported in INE (1986c), p.79; INE (1986), p.24, 31 and Ministry of Health (1985), Table 7.

NOTES

1. Figures refer to actual expenditure from January to October 1984 and 1985, see INE (1986) p. 32.

2. See Ministry of Health (1985) p. 3-10, 33-35.

3. These estimates should be taken cautiously. I have taken the distribution of population from ANSSA (1985). Distribution of institutions does not necessarily follow the same criteria. Data refer to coverage of a population by particular health group or institution. No detailed explanation of methodology used for the estimation is presented. For the private health group, coverage seems to refer to those having access to formal private institutions; it does not consider those receiving medical attention from private doctors, auxiliary health personnel, and traditional healers.

4. This priority index is defined as the ratio of total government expenditures to government expenditures on health programs. The index is independent of whether expenditures are increasing or declining; it only measures whether expenditures on health programs have been reduced or have increased proportionately to total government expenditures. (See Suarez 1985.)

5. ANSSA (1986) reported that during 1980-84 central government resources and MOH revenues represented approximately 88 and 7 percent respectively. Borrowing was between 1.5 and 4.6 percent and transfers between 0.2 and 1.8 percent (see Table 4.7.1, p. 96).

6. Transfers seem now to be considered within the general budget as a result of the integration of some decentralized health institutions to which these transfers were made.

7. In 1934 stevedore workers from Callao, Peru's main seaport, and jockeys were incorporated into the existing retirement and pension programs.

8. For a detailed description of the evolution of the social security system in Latin American countries and Peru see Cepal (1985), Messa-Lago (1981), and Roemer (1975).

9. See studies from Webb (1977) and Figueroa and Webb (1977).

10. The 2.4 percent share has been estimated by using as weights the share of medical expenditure of each of the eight communities and by corresponding share of the value of the monetary exports. Data has been taken from Figueroa (1983), Tables 3.4 and 3.5, pp. 63-65. Import shares ranged from 0.3 to 6.6 percent.

11. Although existing information shows the possibility of presenting more detailed calculations, they are out of the scope of the present paper.

12. For a summary of health status indicators of the various countries and regions of the world see World Bank (1980).

13. A recent report from MOH presents estimates that the under five years age groups accounted for more than 45 percent of total deaths. But no specific data on deaths by age group is presented. See Ministerio de Salud (1986), p. 3.

14. Data needed to evaluate health status of the population and efficiency of the medical care systems should combine age groups and morbidity and mortality rates; regrettably such statistics are not readily available. For Peru, knowledge of incidence of illness is based on cases of illness reported to health personnel and is reported in MOH annual reports. A detailed collection of data on causes of deaths by type of illness, gender, and age group is compiled by WHO.

15. A preliminary discussion of this issue in terms of cost per preventative and curative health service is presented by Musgrove (1986).

16. For references and discussions on the relation between access to drinkable water and sanitation facilities and improvements in health, see World Bank (1970), pp. 23-27.

17. See PAHO (1982).

18. A discussion of definitions and issues related to defining and selecting health coverage indicators is contained in a collection of yet unpublished articles from Montoya Aguilar and Marin-Lira from WHO. I would like to thank the first author for providing the material presented here.

19. This observation is derived from the analysis of the Ministry of Health Plan 1985-86, and from the way such plans have been conducted in the past. For a summary of the planning process see OIH (1977), p. 82-96.

20. BCR study estimates that in 1980 only 26.9 percent of doctors and nurses and 11.3 percent of dentists were employees; the rest were working for the corporate and private health sector (see BCR [1984], p. 30). Concentration of health personnel in urban areas and in coastal cities can be thought of as the result of optimal market allocations. Given the patterns of distribution of income and wealth, allocation of MOH resources seems to have done little in altering spatial distribution patterns.

21. This is one of the conclusions from Musgrove's interpretation of BCR data. See Musgrove (1986), p. 5. Data are presented in Table A.IV.2.

22. A description of the organizational and methodological aspects of the survey can be found in Musgrove (1985) and in INE (1986).

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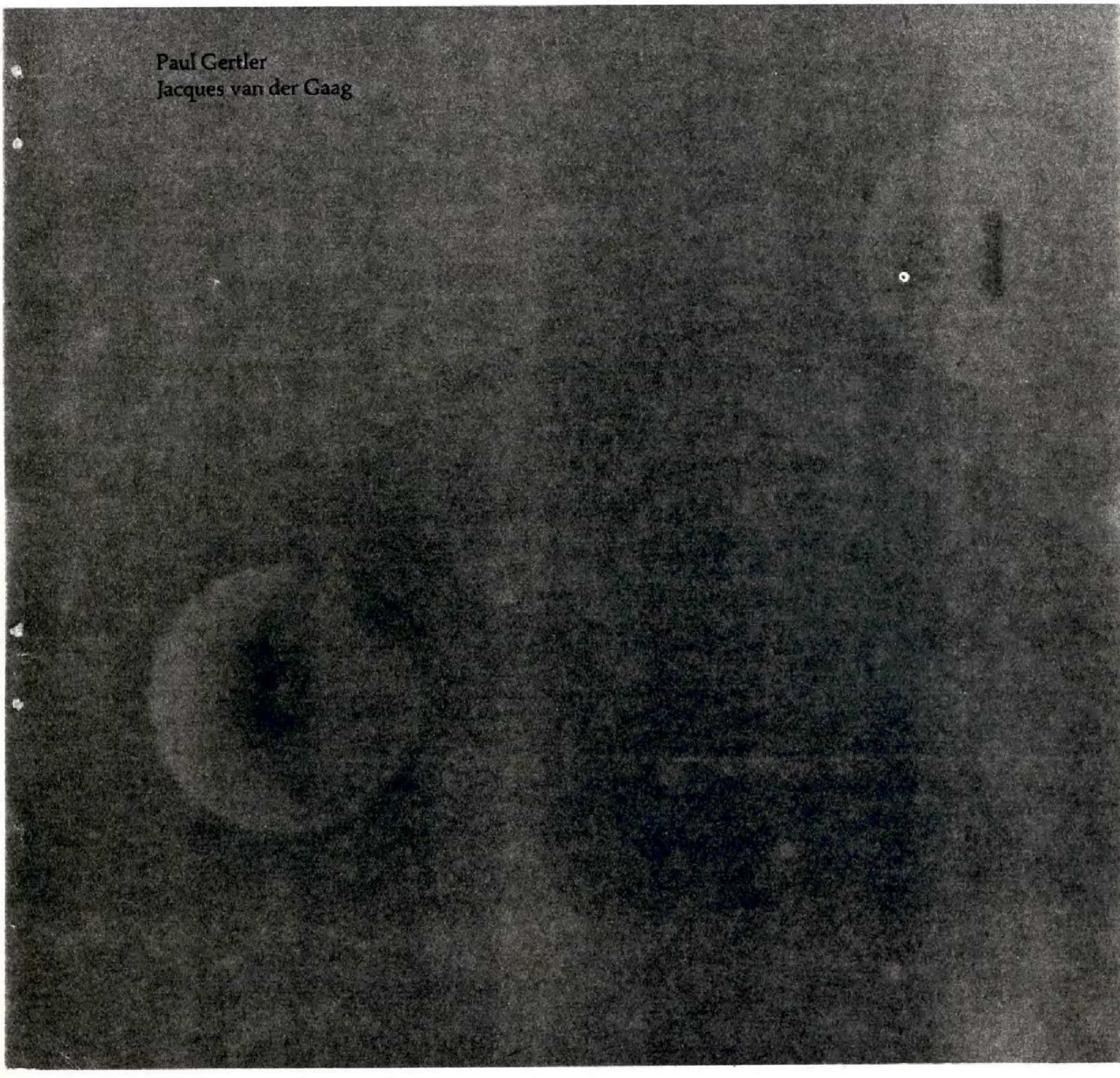

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Measuring the Willingness to Pay for Social Services in Developing Countries

The Living Standards Measurement Study

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Measuring the Willingness to Pay for Social Services in Developing Countries

Paul Gertler
Jacques van der Gaag

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ABSTRACT

We provide a methodology for the _ex ante_ evaluation of the welfare effects of proposals to use user fees to finance improved access to social services in developing countries. The analysis requires estimation of demand functions, from which price elasticities and the willingness to pay for improved access can be obtained. The willingness to pay is the maximum price that can be charged without reducing individuals' welfare and utilization of medical services. The estimation is complicated by the problem that governments in developing countries often are the dominant suppliers of social services in their countries, and provide these services free of charge so that there is little price variation in the data. We show how variation in individuals' private time prices can be used to identify all of the parameters of the demand functions.

The methodology is used to evaluate the possible implementation of the user fee plan for medical care clinics in rural Côte d'Ivoire. Our results show that it is likely to have highly regressive welfare effects. Specifically, the policy is shown to increase the welfare and medical care utilization of individuals in the top half of the income distribution, while reducing the welfare and medical care utilization of individuals in the bottom half of the income distribution.

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TABLE OF CONTENTS

I. INTRODUCTION

Providing access to social services such as medical care and education is a top priority for many developing countries. Indeed, over the last twenty-five years public medical care centers and schools have proliferated throughout the developing world. These facilities typically charge little or nothing for their services, and tend to be concentrated in urban areas so that rural dwellers must often travel long distances to avail themselves of the services.[1] A large scale expansion of social services to the rural areas is complicated by the current financial crisis in the developing world. Governments faced with huge foreign debt and large fiscal deficits are reluctant, and in many cases unable, to further bloat their budgets by opening new (free) social service programs.

An increasingly popular proposal is to finance social services through user fees (access charges). These fees are a means of recovering some and possibly all of the variable costs of operating facilities, and, if they are set at marginal cost, are likely to improve allocative efficiency. Thus, user fees may allow governments to expand social services to rural areas without adding a permanent increase to their annual budgets.[2]

Any implementation of the user fee plan requires an *ex ante* evaluation of the welfare consequences. This, in turn, requires knowledge of the properties of the demand function, especially price elasticities and the effects of other non-monetary costs such as travel time. The price elasticities provide information about how user fees will affect utilization and revenues. Travel time effects can be used to measure the amount individuals are willing to pay for improved access (reduced travel time). If governments open new social service facilities in rural areas, then the willingness-to-pay is the maximum price that can be charged without making individuals worse off.

The usually straight-forward exercise of demand estimation is greatly complicated in developing countries by the fact that there is little or no price variation within a country. In many developing countries the vast majority of social services are run by the government who set prices close, and in many cases equal, to zero. Even when prices are positive, they are typically small and uniform within the country. A second issue in modeling the demand for social services is that the decision to use them is discrete. For example, in the case of medical care, individuals choose whether to obtain care from a clinic, hospital, private doctor or to treat themselves.

We derive a discrete choice specification of the demand for medical care from a theoretical model in which private time price variation can be used to identify the parameters necessary to compute monetary price elasticities and willingness-to-pay measures (compensating variations). The model makes use of the well known result that private prices such as the opportunity cost time ration the market when monetary prices are absent or small (Becker, 1965).[3] An added advantage of the model is that it is flexible enough to allow the price elasticities and willingness-to-pay measures to vary by income levels, so that the distributional welfare effects of user fees can also be examined. Moreover, the model is easily adaptable to other social service markets such as education and family planning.

Most studies of the demand for medical care in developing countries have found little impact of prices on demand. These studies typically model demand as a discrete choice with the price effect specified to be independent of income.[4] This assumption is extremely restrictive, since one would expect the wealthy to be less sensitive to price differences among providers than the poor. Gertler, Locay, and Sanderson (1987) show that these models are inconsistent with utility maximization, and derive a discrete choice specification from a theoretical model that implies a natural interaction between price and income in the demand functions. They find, for the case of Peru, that prices are important determinants of medical care demand and that demand indeed becomes more elastic as income falls.

The studies mentioned above specify time prices as non-monetary nuisance parameters in the utility function, implying that their coefficients reflect the marginal disutility of traveling. Becker (1965) points out that time prices should enter via the budget constraint. Dor, Gertler, and van der Gaag (1987) extend Gertler, Locay, and Sanderson by including time prices in the budget constraint to estimate travel time elasticities. We show that variation in travel time is sufficient to identify all of the parameters necessary to compute monetary price elasticities and compensating variations.

We use this model to evaluate the potential welfare effects of employing user fees to finance an expansion of medical care facilities in rural Cote d'Ivoire. This area is an especially appropriate region for such analysis as income levels are extremely low and the only available medical care is is from sparsely-located free government facilities. Our results show that the policy would be highly regressive. Specifically, it would increase the welfare and medical care utilization of individuals in the top half of the income distribution, but reduce the welfare and medical care utilization of individuals in the bottom half of the income distribution.

II. A MODEL OF THE DEMAND FOR MEDICAL CARE

Our framework is a model in which utility depends on health and on the consumption of goods other than medical care. If an illness or accident is experienced, individuals must decide whether or not to seek medical care. The benefit from consuming medical care is an improvement in health, and the cost of medical care is a reduction in the consumption of other goods.

Individuals have to decide not only whether to seek care, but also what type of care. They are able to choose from a finite set of alternative providers one of which is self-treatment. Each provider offers an expected improvement in health (efficacy) for a price. Let us define the quality of an alternative provider as the expected improvement in health as a result of that provider's medical care. The price of an alternative includes both monetary outlays and private access costs such as the opportunity cost of travel time. Based on this information and their incomes, individuals choose the alternative that yields the highest utility.

Formally, let the expected utility conditional on receiving care from provider j, be given by

$$U_j = U(H_j, C_j) \tag{1}$$

where H_j is expected health status after receiving treatment from provider j, and C_j is consumption net of the cost of obtaining care from provider j.

The medical care purchased from provider j is invested in health. The quality of provider j's medical care is defined as the expected improvement in health over the health that an individual would expect if he or she treated him or herself. In essence, quality is an expected marginal product. Let H_0

be expected health status without professional medical care (i.e. self-treatment). Then, the quality of provider j's care is $Q_j = H_j - H_0$, which yields an expected health care production function of the form

$$H_j = Q_j + H_0. \tag{2}$$

Quality, as specified, varies by provider, but it may also vary by individual characteristics such as health status and education.

The health production function assumes a simple form for the self-care alternative. Since $H_j = H_0$, we have $Q_0 = 0$. This implicitly normalizes the health care production function so that the quality of a particular provider's care is measured relative to the efficacy of self-care.

Consumption expenditures (net of medical care) are derived from the budget constraint. The total price of medical care includes both the direct payment to the provider and the indirect cost of access (e.g. the opportunity cost of travel time). Let P_j^* be the total price of provider j's care and Y be income, so that the budget constraint is

$$C_j + P_j^* = Y, \tag{3}$$

with $C_j \geq 0$ required for the jth alternative to be feasible. Substitution of (3) into (1) for C_j yields the conditional indirect utility function

$$U_j = U(H_j, Y - P_j^*).$$

Notice that income affects utility through the consumption term, and that the price of medical care is foregone consumption.[5]

We are now ready to specify the utility maximization problem. Suppose the individual has J+1 feasible alternatives (with the j=0 alternative being self-care). The unconditional utility maximization problem is

$$U^* = \max(U_0, U_1, \ldots, U_J), \tag{4}$$

where U^* is maximum utility.

III. EMPIRICAL SPECIFICATION

The solution to (4) yields a system of demand functions, whose forms are probabilities that the alternatives are chosen. The probability that a particular alternative is chosen equals the probability that this choice yields the highest utility among all the alternatives. Thus, the functional form of the demand functions depends on the functional form of the conditional utility function and the distribution of the stochastic variables.

The Conditional Utility Function

Gertler, Locay and Sanderson (1987) show that income can influence the choice of provider only if the conditional utility function allows for a non-constant marginal rate of substitution of health for consumption. A parsimonious functional form that does not impose a constant marginal rate of substitution is the semi-quadratic, which is linear in health and quadratic in consumption. Specifically, let the conditional utility function be

$$U_j = \alpha_0 H_j + \alpha_1 C_j + \alpha_2 C_j^2 + \epsilon_j \tag{5}$$

where ϵ_j is a zero mean random taste disturbance with finite variance and is uncorrelated across individuals and alternatives.

Consumption (net of the cost of obtaining care from provider j) is derived from the budget constraint in (3). Specifically $C_j = Y - P_j^*$. The full price of medical care is the direct payment to the provider plus the value of time spent in obtaining the care. Consumption, then, is

$$C_j = Y - P_j - wT_j \tag{6}$$

where P_j is the direct payment to provider j, w is the opportunity cost of time, and T_j is the time spent obtaining care from provider j.

Substitution of (6) into (5) yields

$$U_j = \alpha_0 H_j + \alpha_1(Y - P_j - wT_j) + \alpha_2(Y - P_j - wT_j)^2 + \epsilon_j \quad (7)$$

Since $P_0 = T_0 = 0$, the conditional utility function in (7) reduces to

$$U_0 = \alpha_0 H_0 + \alpha_1 Y + \alpha_2 Y^2 + \epsilon_0 \quad (8)$$

for the self-care alternative.

The identification of the parameters in (7) requires that the values of expected health and consumption differ across the alternatives. The alternative chosen is the one that yields the highest utility. Therefore, if the contribution of either expected health or consumption to utility is constant across alternatives they cannot influence which alternative is chosen.

If we had assumed a linear utility function, which imposes a constant marginal rate of substitution, the third term on the right-hand side of (7) would not be present. The contribution of income to utility would then reduce to $\alpha_1 Y$, which is constant across alternatives. Since only differences in utility matter, income would not be allowed to influence which alternative is chosen. The second order consumption term implicitly includes a price-income interaction whose value is not constant across alternatives, and therefore is not differenced out of the model. This price-income interaction allows price effects to vary by income.[6]

At this point it is easy to show that all of the parameters can still be identified if monetary prices are zero. The identification of α_1 and α_2 in

(9) requires variation in prices and/or travel time across alternatives so that the contribution of consumption varies across alternatives. Hence, it is obvious that it is sufficient to have variation in T_j across alternatives.

Quality

The remaining issue in the specification of the conditional utility function is the measurement of the expected efficacy (quality) of each alternative. Substitution of the health production function (2) into the conditional utility function (7) yields

$$U_j = \alpha_0 H_j + \alpha_0 Q_j + \alpha_1 (Y - P_j - wT_j) + \alpha_2 (Y - P_j - wT_j)^2 + \epsilon_j. \tag{9}$$

Since $Q_0 = 0$, the conditional utility function in (8) for the self-care alternative reduces to

$$U_0 = \alpha_0 H_0 + \alpha_1 Y + \alpha_2 Y^2 + \epsilon_0. \tag{10}$$

The $\alpha_0 H_0$ term appears in all the conditional utility functions, and its value is constant across alternatives. Since only differences in utility matter, these terms can be ignored.

In the non-self-care conditional utility functions in (9), quality is unobserved. We solve this problem by letting Q_j be a parametric function of its observable determinants. The expected quality of provider j's care is the expected improvement in health (marginal product) over the expected level of health that would occur from self-treatment. The expected improvement in health can be viewed as being produced through a household production function. The arguments of the household production function are provider characteristics, and individual characteristics such as health status and ability to implement the recommended treatment plan. For example, the expected improvement in health from hospital care relative to self-care may be increasing in education, since individuals with higher education may be better able to implement recommended treatment plans.

The marginal utility of an individual's health may vary by family. For example, the marginal utility of the health of a child may depend on how many children there are in the household. In general, the value of health may vary with many demographic variables such as age, sex, education, and family composition.

The basic determinants of both the quality household production function and the marginal utility of quality are demographic variables. Pollak and Wachter (1975) argue that the separate effects of demographic variables in the household production function and in the marginal utility of quality cannot be identified. We therefore, specify a reduced form model of the utility from quality. Formally, let the utility from quality be given by

$$\alpha_0 Q_j = \beta_{0j} + \beta_{1j} X + \eta_j, \tag{11}$$

where X is a vector of demographic variables and η_j is a zero mean random disturbance with finite variance.

To make the specification as general as possible, we let the coefficients in (11) vary by alternative. Allowing for different intercepts permits the baseline quality to vary by alternative, and having different slope coefficients allows the provider's productivity relative to self-care to vary with individual characteristics such as age, education, and severity of illness.

The random disturbance captures unmeasured portions of the quality function such as severity of illness. These disturbances may be correlated across alternatives.

Since $Q_0 = 0$, the utility from quality simplifies to $\alpha_0 Q_0 = 0$ for the self-care alternative. Hence, the coefficients in (11) are interpreted relative to the self-care alternative. Notice further that the normalization sets the unobserved portion of quality in the self-care alternative, η_0, to zero.

Substitution of (11) into the conditional utility functions in (9) yields

$$U_j = V_j + \eta_j + \epsilon_j, \tag{12}$$

where

$$V_j = \beta_{0j} + \beta_{1j}X + \alpha_1(Y - P_j - wT_j) + \alpha_2(Y - P_j - wT_j)^2 \tag{13}$$

Notice that the intercept and coefficients on the demographic variables vary by alternative, whereas the coefficients on the economic variables are constant across alternatives. Further, the disturbances in the non-self-care conditional utility functions are correlated with each other but are uncorrelated with the disturbance in the self-care conditional utility function.

The Demand Functions and Welfare

The demand function for a provider is the probability that the utility from that alternative is higher than the utility from any of the other alternative. Most of the previous studies on the demand for medical care in developing countries have assumed that these demand functions take on a multinomial logit (MNL) form.[7] As discussed in McFadden (1981), the MNL suffers from the Independence of Irrelevant Alternatives assumption. This assumption is equivalent to assuming that the conditional utility functions are uncorrelated across alternatives, and imposes the restriction that the cross-price elasticities are the same across alternatives. A computationally feasible generalization of the MNL is the Nested Multinomial Logit (NMNL), which was introduced in McFadden (1981). The NMNL allows for correlation across subgroups of alternatives and, therefore, non-constant cross-price elasticities.

There are three medical care choices in the rural Cote d'Ivoire; let choice 0 be self-care, choice 1 be clinic, and choice 2 be hospital care. The η_j's imply that the hospital and clinic alternatives may be correlated with each other, but not with the self-care alternative. Therefore, the self-care demand function (i.e. the probability of choosing self-care) is

$$\Pi_0 = \frac{\exp(V_0)}{\exp(V_0) + \left[\exp(V_1/\sigma) + \exp(V_2/\sigma)\right]^{\sigma}} \tag{14}$$

and the probability of choosing a hospital or clinic is

$$\Pi_i = \left[1 - \Pi_0\right] \frac{\exp(V_i/\sigma)}{\exp(V_1/\sigma) + \exp(V_2/\sigma)} \qquad (i = 1,2) \tag{15}$$

where σ is one minus the correlation between the hospital and clinic conditional utility functions introduced by the η_j's. McFadden (1981) shows that σ must be between zero and one for the model to be consistent with utility maximization, and when $\sigma = 1$ the NMNL reduces to an MNL.

The estimated demand functions can be used to project the impact of user fees on demand (and revenues), and on the number of people who do not seek health care as a result of user fees. These demand functions also form the basis of our measurement of the willingness to pay for reduced travel time to a medical care facility. The willingness-to-pay measure is calculated as a compensating variation.[8] For example, consider changing the vector of provider travel times from T to T$'$. Following Small and Rosen (1981), in the case of a nested multinomial logit, the amount of income that an individual must be given to make him as well off at T$'$ as he or she was at T is

$$\begin{aligned} cv = (1/\lambda)\Big\{\ln\Big[\exp(V_0) + \big(\exp(V_1/\sigma) + \exp(V_2/\sigma)\big)^{\sigma}\Big] - \\ \ln\Big[\exp(V_0') + \big(\exp(V_1'/\sigma) + \exp(V_2'/\sigma)\big)^{\sigma}\Big]\Big\} \qquad (16) \end{aligned}$$

where V_j and V_j' are evaluated at T and T$'$, respectively, and where λ is the marginal utility of income.[9]

IV. THE DEMAND FOR MEDICAL CARE IN COTE D'IVOIRE

Data and Institutional Structure

The data used in this study come from the 1985 Cote d'Ivoire Living Standard Survey (CILSS). This multi-purpose household survey collected data on many socio-economic factors including information on illness and medical care utilization in the four weeks prior to the survey.[10] In addition, the CILSS collected community level information in rural areas. For each village, information on travel time to the nearest available medical facility of every type, and average male and female agriculture wage rates were obtained. When a facility was available in the village, travel time was recorded as zero.

The sample used for estimation excluded non-farm households and households in villages for which the community information was not completed. The exclusion of non-farm households reduced the sample by 7%, and the exclusion of villages without community level data reduced the sample by another 8%. The final sample included 980 adults and 744 children under age 16, all of whom experienced an accident or illness in the four weeks prior to the survey.

Since there are no private health care facilities in rural Cote d'Ivoire, persons who wish to obtain medical care must choose between government clinics and hospitals. These government facilities had no user fees in 1985, implying that the price of care was the opportunity cost of time spent of obtaining care. The opportunity cost of time is calculated as the product of the round-trip travel time and the appropriate village agricultural wage rate. For children the opportunity cost of the mothers' time is used.[11]

Monthly income is measured as the annual value of total household consumption divided by 12, which is a reasonable approximation of household permanent income.[12] Using consumption rather than reported earning allows us to include the value of home production. Home production is a major non-market source of income in subsistence economies. In rural Cote d'Ivoire, the value of homegrown produce consumed by household amounts to approximately half of the food budget and 30% of total consumption. Another reason to prefer consumption is that transitory shocks affect consumption much less than earnings.

The arguments of the alternative specific utility of quality functions specified in (11) are individual and family characteristics that may affect quality and the marginal utility of quality. Variables that may influence the efficacy of medical care include age, the number of healthy days last month, education, the number of other adults in the household, and the number of children in the household. Age and the number of healthy days proxy for health status. Age is entered in spline form with the break occurring at 40 years old for adults and at 3 for children. The break points were determined by grid searches. Education (years of schooling) is included since more educated individuals may be better able to implement recommended treatments and therefore produce more health relative to self-care than can less educated individuals. In the case of children the mother's education is used. The family composition variables are included because the more adults and fewer children in the household the better able a household may be at self-treating an illness. Variables that may affect the marginal utility of quality include age, sex, household composition, and the size of the farm measured in hectares of land. Descriptive statistics of the variables discussed in this section are presented in Table 1.

Table 1: Descriptive Statistics

	Adults		Children	
Variable	Mean	Standard Deviation	Mean	Standard Deviation
Clinic [a/]	0.24	(0.49)	0.30	(0.55)
Hospital [a/]	0.15	(0.38)	0.14	(0.37)
Clinic Travel Time [b/]	1.18	(1.32)	0.92	(1.16)
Hospital Travel Time [b/]	1.90	(.92)	1.56	(1.60)
Monthly Family Income [c/]	97.85	(81.19)	108.41	(99.66)
Hourly Wage [d/]	75.48	(28.54)	74.89	(26.42)
Age	44.85	(17.12)	6.33	(3.64)
Male	0.46	(0.50)	(0.54)	(0.50)
Education	0.85	(2.16)	0.91	(2.88)
Healthy Days	18.60	(9.94)	22.34	(7.24)
Number of Adults	4.57	(2.96)	4.62	(3.01)
Number of Children	4.86	(2.44)	4.97	(2.77)
Hectares of Land	8.42	(8.75)	9.33	(11.72)
Sample Size	980		744	

a/ Binary variables; equals one if alternative is chosen and zero otherwise.

b/ Round trip travel time; reported in hours.

c/ Reported in thousands of Ivorian CFA's. In 1985, the exchange rate was approximately 461 CFA per U.S. dollar.

d/ Reported in CFA's.

Estimation Results

The NMNL was estimated by full information maximum likelihood separately for the adult and children samples.[13] The results are presented in Table 2, and are generally consistent with economic theory. The estimated value of σ is 0.26 for the adult model and 0.47 for the children model. The estimates are both significantly less than one and significantly greater than zero at the 1% level. Therefore, the models are consistent with utility maximization, and the data reject the MNL in favor of the NMNL.

In both models the coefficients on the consumption and its square are significantly different from zero. Prices enter the model via these terms. If the prices did not vary across alternatives, the coefficients of the consumption terms would not be identified, since the value of consumption would then be constant across alternatives. The fact that these coefficients are significant implies that the relative prices of the alternatives are important determinants of provider choice. The direction and magnitude of the price and income effects is examined in the next section.

In the model for adults the coefficients on the first age splines are not significantly different from zero, implying that age differences between 16 and 39 do not influence provider choice. The coefficients on the age forty and over splines are negative and significant, showing that after age 40 the probability of obtaining medical care in case of injury or illness declines with age. The effects of sex and education are not significantly different from zero. The negligible education effect is most likely a result of the small variation in education in the sample. Not surprisingly, the number of healthy days last month significantly reduces the probability of seeking

**Table 2: Nested Multinomial Logit
Coefficient Estimates and T-Statistics**

Variable	Adults		Children	
	coefficient	t-statistics	coefficient	t-statistics
Consumption (α_1)	13.67	(5.18)	18.97	(4.47)
Consumption Squared (α_2)	-0.03	(2.56)	-0.02	(1.82)
Sigma	0.26	(3.07)	0.47	(3.67)
Clinic Alternative				
Constant	0.07	(0.04)	2.12	(2.21)
Age 1	0.03	(0.65)	-0.54	(2.19)
Age 2	-0.14	(2.43)	0.03	(0.55)
Education	-0.02	(0.14)	0.02	(0.41)
Healthy Days	-0.13	(2.26)	-0.05	(1.84)
Male	0.08	(0.15)	0.36	(1.02)
Children	0.21	(1.65)	-0.12	(1.74)
Adults	-0.12	(0.90)	-0.22	(2.27)
Land	0.07	(1.44)	0.03	(1.59)
Hospital Alternative				
Constant	1.25	(0.68)	2.36	(2.22)
Age 1	0.00	(0.09)	-0.59	(2.19)
Age 2	-0.14	(2.54)	0.02	(0.38)
Education	-0.04	(0.25)	0.02	(0.29)
Healthy Days	-0.16	(2.78)	-0.08	(2.50)
Male	0.68	(1.13)	0.09	(0.23)
Children	0.19	(1.47)	0.14	(1.62)
Adults	-0.19	(1.31)	-0.20	(1.97)
Land	0.10	(2.32)	0.04	(1.64)
Sample Size	980		723	
-Log Likelihood	830.96		655.50	

medical care.[14] The number of adults in the household has a negative effect on the probability of going to both clinics and hospitals, while the number of children has positive effects. Finally, the coefficient on land is positive for both clinics and hospitals, but significant only in the hospital equation.

In the model for children, the coefficients on the age splines show that demand falls with age from zero to three years old and is flat thereafter. As in the adult model, education and sex do not appear to influence provider choice. Again, better health reduces demand as the number of effect of healthy days is negative and significant. Finally, the number of children, number of adults, and land variables influence childrens' choices much in the same way as they influence adults' choices.

Price Elasticities and Income Effects

Since prices and income enter the demand functions in a highly non-linear fashion, it is hard to assess the direction and magnitude of their effects on demand. To facilitate this, we present arc price elasticities of the demand for clinic and hospital care by income quartiles in Table 3. The arc elasticities are obtained by sample enumeration within each income quartile.[15] They were calculated for three range of 50 CFA each, covering 0 to 150 CFA. Reading down a column of Table 3 reflects the change in the price elasticity moving down the demand curve, holding income constant. Reading across a row of Table 3 reflects the change in the price elasticity as income rises, holding price constant.

Two types of elasticities are presented in Table 3. The first is the "own" price elasticity which calculates the percentage change in demand with for a 1% change in price. For example, an increase in the clinic price causes some individuals to substitute hospital care for clinic care, and others to substitute self-care for clinic care. The own price elasticity measures the total change in clinic demand. The second type is the "net" price elasticity, which examines the portion of demand that leaves the professional health care market for self-care. The own elasticity is useful for determining the effect of various pricing policies on a facility's utilization and revenues, and the net elasticity is of interest because it measures the number of individuals forced out of the medical care market as a result of the policies.

We begin with a discussion of the own price elasticities. Clinic and Hospital demand are both substantially more elastic at higher prices as the own price elasticities increase three fold on average over the price range considered. The results also show that demand is vastly more elastic at the lower income levels. The clinic own price elasticities for the lowest income quartile are between three and six times larger than those for the highest income quartile. A similar pattern emerges for hospitals. These results indicate that user fees will be regressive and substantially reduce the facility's utilization by the poor.

The net price elasticities are approximately one-third the price elasticities, but are non-trivial in magnitude in the three lower income quartiles. This implies that increasing user fees will substantially reduce the utilization of any medical care by the poor.

Table 3: Arc Price Elasticities by Income Quartile

Price Range	Quartile 1 (lowest) Own	Quartile 1 (lowest) Net	Quartile 2 Own	Quartile 2 Net	Quartile 3 Own	Quartile 3 Net	Quartile 4 (highest) Own	Quartile 4 (highest) Net
Adults-Hospital								
0-50 CFA	-0.48	-0.14	-0.41	-0.11	-0.35	-0.09	-0.11	-0.03
50-100	-0.95	-0.24	-0.80	-0.19	-0.66	-0.15	-0.17	-0.04
100-150	-1.52	-0.43	-1.26	-0.27	-1.03	-0.21	-0.23	-0.05
Adults-Clinic								
0-50 CFA	-0.37	-0.15	-0.33	-0.12	-0.30	-0.10	-0.12	-0.04
50-100	-0.73	-0.25	-0.65	-0.21	-0.59	-0.16	-0.19	-0.06
100-150	-1.17	-0.37	-1.06	-0.30	-0.94	-0.23	-0.24	-0.08
Children-Hospital								
0-50 CFA	-0.79	-0.29	-0.70	-0.26	-0.61	-0.21	-0.22	-0.07
50-100	-1.58	-0.51	-1.38	-0.46	-1.18	-0.36	-0.31	-0.09
100-150	-2.46	-0.73	-2.16	-0.67	-1.83	-0.52	-0.34	-0.10
Children-Clinic								
0-50 CFA	-0.58	-0.30	-0.54	-0.27	-0.48	-0.22	-0.20	-0.10
50-100	-1.22	-0.56	-1.12	-0.50	-0.99	-0.40	-0.31	-0.15
100-150	-1.99	-0.85	-1.86	-0.74	-1.61	-0.58	-0.36	-0.17
Mean Income CFA	32,500		62,490		96,350		200,610	

Welfare Neutral Prices

In this section we evaluate the effect on consumers' welfare of the proposal to locate clinics in villages that currently have no facilities and then charge user fees for access. To be efficient the user fee should be set at marginal cost. The benefit to individuals from implementing this proposal depends on whether the reduction in welfare resulting from having to pay user fees is less than the improvement in welfare from having access to medical care facilities within the village. The welfare neutral fee is the amount consumers would be willing to pay not to have to travel to the closest free facility in a nearby village (i.e. the compensating variation). If the welfare neutral fee is more than the marginal cost of medical care, then the policy is welfare improving and more individuals will utilize medical care. On the other hand, if the welfare neutral fee is less than marginal cost, then the policy would reduce welfare and medical care utilization. Clearly, the magnitude of the welfare gain (or required subsidy) will vary by income level as relatively well off families are likely to be willing to pay more than are poorer families.

The welfare neutral prices are derived from compensating variation experiments. Four welfare neutral prices are calculated for an average individual in each income quartile; how much an individual is willing to pay not to have to travel to a free clinic that is 0.5 hours away, 1.0 hour away, 1.5 hours away, and 2.0 hours away. The experiments are conducted assuming that the closest hospital is two hours away.

The welfare neutral prices are reported in Table 4. Reading down a column shows the change in the price as the distance of the clinic rises, holding income constant. Reading across a row shows the change in the price as income rises, holding distance constant. The welfare neutral prices increase with distance and income for both children and adults. Adults in the highest income quartile are willing to pay three times as much as adults in the lowest income quartile, and children in the highest income quartile are willing to pay twice as much as children in the lowest income quartile.

Now we assess the welfare implications of locating clinics in villages that currently have no facilities and setting user fees at the marginal cost of supplying medical care. The effect on welfare is determined by comparing the welfare neutral price to the marginal cost of providing clinic care. We consider the effect of a reduction in travel time of two hours. As an estimate of marginal we use the average price of private medical care in urban areas. From the urban component of the CILSS, the average price of visit to a private medical provider was 35 CFA. From Table 4, our estimates show that individuals in lower half of the rural income distribution are <u>not</u> willing to pay 35 CFA, but individuals in the top half are willing to pay that amount and more. Hence, under this scenario, implementing the user fee proposal will <u>improve</u> the welfare of individuals in the top half of the income distribution and increase their utilization of medical care. However, implementing the user fee proposal will also <u>reduce</u> the welfare of individuals in the bottom half of the income distribution and lower their utilization of medical care. Hence, the user fee proposal would be regressive in rural Cote d'Ivoire in that it would benefit the wealthy and hurt the poor.

Table 4: Amount Willing to Pay to Avoid Traveling for Clinic Care

Distance to Nearest Clinic	Quartile 1 (lowest)	Quartile 2	Quartile 3	Quartile 4 (highest)
Adults				
.5 hours	7.53	8.37	10.10	17.56
1	13.82	15.50	18.78	33.57
1.5	18.82	21.28	25.89	47.95
2	22.44	25.64	31.33	60.68
Children				
.5 hours	12.36	12.97	14.86	19.56
1	20.32	21.57	24.69	33.39
1.5	24.98	26.81	30.59	42.37
2	27.40	29.61	33.70	47.59
Mean Income	32,500	62,490	96,350	200,610

V. CONCLUSIONS AND POLICY REFORM

We provide a methodology for the ex ante evaluation of the welfare effects of proposals to use user fees to finance improved access to social services in rural areas of developing countries. The analysis requires estimation of demand functions, from which price elasticities and the willingness to pay for improved access can be obtained. The willingness to pay is the maximum user fee (welfare neutral price) that can be charged without reducing individuals' welfare and utilization of medical services. The estimation is complicated by the problem that developing governments often are the dominant suppliers of social services in their countries, and provide these services for free so that there is little price variation in the data. We show how variation in individuals' private time prices can be used to identify all of the parameters of the demand functions.

The methodology is used to evaluate the possible implementation of the user fee plan for medical care clinics in rural Cote d'Ivoire. Our results show that it is likely to have highly regressive welfare effects. Specifically, the policy is shown to increase the welfare and medical care utilization of individuals in the top half of the income distribution, while reducing the welfare and medical care utilization of individuals in the bottom half of the income distribution.

These adverse distributional effects can be avoided by introducing price discrimination into the user fee proposal. User fees at clinics in poorer villages can be set at different levels than user fees in richer villages. As long as the user fees are below the welfare neutral prices, the policy will be welfare improving for everyone. The degree to which the price is below the welfare neutral price determines the improvement in welfare and medical care utilization achieved by this policy. With this type of price discrimination, the clinics in richer villages are self financing, while the clinics in poorer villages require a subsidy.

ENDNOTES

1 For a detailed description of medical care delivery systems and pricing policies in developing countries see de Ferranti (1985)

2 The user fee proposal is discussed in Jimenez (1987).

3 The role of time prices in theory of the allocation of time was first applied to the demand for in medical care in Phelps and Newhouse (1974) and Acton (1975).

4 Studies of the demand for health care in developing countries that employ this specification include Akin et.al. (1981, 1985 and, 1986), Birdsall and Chuhan (1986), Dor and van der Gaag (1987), and Mwabu (1986). Heller (1983) and Musgrove (1983) estimate family medical care expenditure functions but do not consider price effects.

5 The time spent obtaining care could, in principle, come at the expense of work in the market place, production work at home or leisure. In that case, income Y_j, and net consumption, C_j, should incorporate the value of the three activities. In an economy that is only partially monetized, such as the one in rural Cote d'Ivoire, non-traded home production is a major source of income. We capture this by including the value of home production consumed by the household into the measure of income. However, adding the value of leisure would greatly complicate the model and is left for future work. The measurement of income is discussed in Section IV.a.

6 Some authors try to include income in the model by allowing alternative specific coefficients on consumption. This specification is inconsistent with stable utility maximization because it implies that two options that have the same quality and price must yield different levels of utility. This specification has been employed by Akin et.al. (1981, 1985 and, 1986), Birdsall and Chuhan (1986), Dor and van der Gaag (1987), and Mwabu (1986).

7 The exceptions are Gertler, Locay, and Sanderson (1987) and Dor, Gertler, and van der Gaag (1987) who employ Nested Multinomial Logit specifications.

8 See Deaton and Muelbauer (1980) for discussion of compensating variation and other welfare measures.

9 In order for (16) to be exact, the marginal utility of income λ must be independent of alternative specific characteristics and price. See McFadden (1981) and Small and Rosen (1981) for more discussion on this point. Although λ is independent of quality, it is not independent of price. Specifically

$$\lambda = \partial U/\partial Y = \alpha_1 + 2\alpha_2(Y - P).$$

Since the prices are very small relative to income, λ is likely to be approximately constant across small differences is price. Hence, each individual's average marginal utility of income over the alternatives is a good approxima-

tion of λ. Since this approximation is calculated for each individual, λ will vary greatly across individuals as there is substantial variation in income.
10 For detailed information on this survey see Ainsworth and Munos (1985).

11 The male and female village agricultural wage rates are reasonable estimates of the opportunity cost of time. Newman (1987) shows that 97% of all working adults in rural areas of Cote d'ivoire are engaged in agricultural activities. Moreover individual variation in wage rates within village is likely to be small since over 90% of the adults have less than one year of schooling.

12 For a description on how total household consumption was calculated see Glewwe (1987).

13 Hensher (1986) shows that full information maximum likelihood estimation of the NMNL yields substantial gains in efficiency over the more popular two-step estimator.

14 The number of days an individual was healthy may be endogenous in a model of medical care demand. To ensure the robustness of our price and income effects, we reestimated the model on both adult and children samples. There was no difference in the estimated coefficients.

15 See Train (1986) for a discussion on elasticities and sample enumeration in discrete choice models.

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THE WILLINGNESS-TO-PAY FOR MEDICAL CARE

Evidence from Two Developing Countries

Paul Gertler
Jacques van der Gaag

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Washington, D.C. 20433

The Willingness-to-Pay for Medical Care: Evidence from Two Countries

Table of Contents

Acknowledgments

[To be written]

Guide to the Reader

Readers who want to get a quick overview of the contents of this book are advised to read the Introduction, the summary sections that are added to Chapters 2 through 7 and the concluding chapter. Those who want to familiarize themselves with the general issues of health-care financing in less developed countries should read Chapter 2 and, for more detail on health-care infrastructure, Chapter 3. Those two chapters could be skipped by readers who are thoroughly familiar with the health-care systems in the developing world and their financing problems.

Chapter 4 is a non-technical chapter introducing some concepts of welfare economics, as they relate to health-care. This chapter is added to help non-economists to follow the analysis presented in subsequent chapters.

Chapter 5 contains the main theoretical part of this study. It is rather technical, but it is a must for those readers who want to scrutinize the theoretical base of our empirical work. The latter is presented in Chapter 6, which is perhaps the most important chapter.

Readers not interested in the details of the theoretical and empirical work, could make do with reading just the summaries of Chapter 5 and 6 and turning immediately to the policy implications of our findings, which are presented in Chapter 7. This chapter and the concluding one are recommended to anyone who took the trouble of picking up this book.

CHAPTER 1

Introduction

This study is about money. Money to pay for delivering health services in developing countries. It is motivated by the general observation that the health status of the population in less developed countries (LDCs) is well below that in the industrialized world, and that the distribution as well as the quality of health-care in LDCs leave much to be desired. It is well-known that the general lack of resources for health-care services in LDCs is a major cause of this sad state of affairs.

The first chapters of this book show how important health-care is in the development process. We give arguments for the heavy government involvement in the provision of medical care, both in developed and developing countries, and illustrate the shortcomings of the health-care infrastructure in LDCs. The latter is based on detailed information on two countries: Côte d'Ivoire and Peru. In subsequent chapters these countries are used as case studies for the specific, and relatively narrow question we will try to answer: are user fees for medical care a desirable and feasible alternative to government financing?

Throughout the developing world governments provide the bulk of resources for the health-care system. Subsidies for medical education, capital for government hospitals, subsidized drugs and free clinic and hospital services are the rule, not the exception. In this, LDCs do not differ much from industrialized countries where government intervention in the health-care sector ranges from subsidies for selected groups of the population

(e.g. the aged), via general public health insurance schemes, to complete public health-care provider systems in which the government provides medical care free of charge to the entire population.

The main difference between the developed and the developing world is that in the latter resources are much more scarce. Though many other problems can be pointed at - inefficient use of available resources, bias towards the provision of curative rather than preventive care, preferential treatment of politically powerful constituencies - the overall picture is that of a general lack of resources. This picture has become worse during the global recession of the eighties. Oil shocks in the late seventies, combined with tight monetary and fiscal policies in the major industrialized countries, triggered this recession. Oil-importing developing countries were particularly hard hit, but many other LDCs suffered from low prices for their commodity exports, and from low demand for their products in general. The developing world resorted to heavy borrowing which, combined with the sharp increase in interest rates, sky rocketed their debt service costs. For example, Cline (1985) reports that in 1973-77 15.4 percent of export earnings were used to service the debt. In 1985 many countries in Africa and Latin America spent 30 to 55 percent of their export earnings for servicing the debts (e.g. Kakwani, 1988).

Faced with unattainable unbalances in their economy, developing countries started so-called adjusted programs, under the auspicious of the International Monetary Fund and the World Bank. A typical structural adjustment package includes tight fiscal and monetary restraints, and usually results in a significant fall in domestic output, real wages and private consumption levels. Some have argued (e.g. Cornia, et al., 1987) that such

austerity measures have put an unexceptable burden on the poor in these countries, especially through cuts in social sector spending (food subsidies, health-care, education). Few, though, question the necessity of stabilization and adjustment measures for countries with unsustainable unbalances in their economy.

It is well beyond the scope of this study to discuss the pro's and con's of the macro-economic policies that are currently being promoted by the international development community. The importance of the current macro-economic situation in LDCs lies in the recognition that resources are severely constraint, that a return to sustainable economic growth appears to take more time than initially expected, and that fiscal constraint is a major element of the policies put in place to promote such growth.

The latter has an immediate bearing on our study. If the health-care systems in LDCs suffer from lack of resources, and if one can no longer depend on increased government expenditure, where can we find the necessary resources to improve the health-care structure? The common answer to this question is to introduce (or increase) user fees in the system, i.e. let the consumer/patient pay a larger share of the cost.

The feasibility of such a solution depends heavily on the price sensitivity of the demand for medical care. There are two issues here: First, how price elastic is the demand for medical care in general? Clearly, if small changes in the price result in large reductions in utilization, the amount of extra revenues raised will be small, too small perhaps to justify the policy. Secondly, is the demand for medical care for some groups in the population more/less price sensitive than for others? For instance, if the poor, or the aged, or women or children are more price-sensitive than, say,

relatively well-to-do prime aged males, a user fee policy may have distributional consequences that are socially or politically undesirable.

The main part of this study is devoted to answering these two questions. We will answer these questions by analyzing the health-care provider choice of households in rural communities in two developing countries. The answers to these questions are simple: yes, the demand for medical care is price sensitive, but not so that it prevents user fees from being a viable option for resource mobilization. An yes, the poor as well as children will be hurt more by the introduction of user fees than the population in general.

These empirical results are presented in Chapter 6. Their policy implications are demonstrated in Chapter 7, where we simulate the consequences of alternative pricing policies. These consequences are evaluated using three criteria: effects on health care utilization (including the distributional aspects), the potential for revenue raising, and the economic welfare effect on the population.

These two chapters form the core of the empirical study. The rest of the book is devoted to defining the problem and developing a theoretical framework for the analysis. In Chapter 2 we illustrate the importance of health in the development process. In this chapter we also provide and evaluate the main arguments that are usually put forward to justify the heavy government involvement in the health-care system. Chapter 3 provides background information on health and medical care on two continents: Africa and Latin America, with emphasis on Côte d'Ivoire and Peru. Chapters 4 and 5 provide the analytical and theoretical underpinnings of our subsequent empirical work.

In the concluding chapter we rejoin the debate for and against user fees for medical care. We also discuss some of the caveats of our study and provide, inter alia, an agenda for future research. In the final section of that chapter we give suggestions on how, armed with the new empirical evidence, user fees can be introduced in the health-care system in a way that puts a heavy emphasis on the need to protect the poor against the adverse effects of user fees policies.

CHAPTER 2

Health, Health-Care And Development

The health status of the population is one of the most important factors in the economic development process for at least two reasons. First, as an indicator of economic development, it shows the success or failure of a country to provide for the most basic needs of its people (food, save sanitary conditions, shelter, etc). Secondly, health - a form of human capital - is an input in the further development of a country. Health influences the labor supply and productivity of adults and the school enrollment and school performance of children. Furthermore, high infant and child mortality rates are among the most important factors related to high fertility rates which, in turn, play a crucial role in development. (See, among others, Krueger, 1968; World Bank; 1980, Wheeler, 1980, Hicks, 1980 and Balassa, 1985 for a discussion of the roel of human capital in economic development).

As a stylized fact, the correlation between crude health indicators such as child mortality and life expectancy, on the one hand, and per capita income on the other is well documented (e.g. Preston, 1980; Golladay, and Liese, 1980; World Bank, 1980). Another important stylized fact is the correlation between expenditures for medical care and per capita income. Indeed, as we will show in Section 2, this correlation is so strong that, especially for poor countries, knowledge of a country's per capita income suffices to obtain a fairly accurate prediction of its per capita expenditures for medical goods and services.

Given that medical care directly aims at improving the health status of the population and given the correlations between health and economic development and between development and health-care expenditures, one would perhaps expect a somewhat stronger relationship between health status and medical care expenditures than is usually found. We turn to this relationship in Section 3. Our aim is not to develop a model that shows the causal relationships between the three variables of interest: health, health-care and development. Rather, by showing the correlations, we want to highlight one set of reasons why the health status of a population is of such primary concern to policy makers in the developing world as well as in industrialized countries. This concern is frequently manifested in heavy government involvement in the health-care sector, ranging anywhere from the provision of public health-care insurance for selected population groups, to the constitutional right of every citizen to have access to free medical care.

In Section 4 we discuss another set of issues that help explain why in most countries the government is heavily involved in the provision of medical care. Although in many aspects health-care is a "normal" good, with positive income and negative price elasticities, certain aspects of health and medical care make it less desirable to leave the provision of medical goods and services to market forces alone. This does not necessarily mean that government intervention is the appropriate panacea. But, at the very least, it provides an additional explanation for the involvement of governments in the health-care sector.

In the last section of this chapter we turn to the merits and potential hazards of government intervention in the market for medical goods and services. We discuss in general terms the various forms of intervention,

especially as they relate to issues of health-care financing. We also acknowledge the financial and structural constraints that governments must face. Thus, we will present the background for the more detailed and country specific discussion of the organization of health-care markets and their financing mechanisms, presented in Chapter 3. But first we will present a simple descriptive analysis based on aggregated data from 34 countries referring to the year 1975.

2.1. <u>Health and Development</u>

There is a strong positive correlation between health and development. This is demonstrated in Figure 1 where we plot four health indicators against per capita Gross National Product (GNP). The indicators are life expectancy at birth, infant and child mortality rates and the crude death rate, (obtained from the Social Indicators database, World Bank, 1986). The countries chosen are the same as those included in Kravis et al. (1982) and represent all stages of development.[1/] The countries are listed in Table 1 in ascending order of per capita GNP. The lines drawn through the scatter diagrams represent double-logarithmic regressions. The regression results are presented in Table 2.

1/ The Kravis data include information on health-care expenditures. The expenditure data are adjusted so as to be fully comparable across countries. We will use these data in Section 2.2.

Table 1. **Gross National Product Per Capita; Selected Countries 1975** 1/

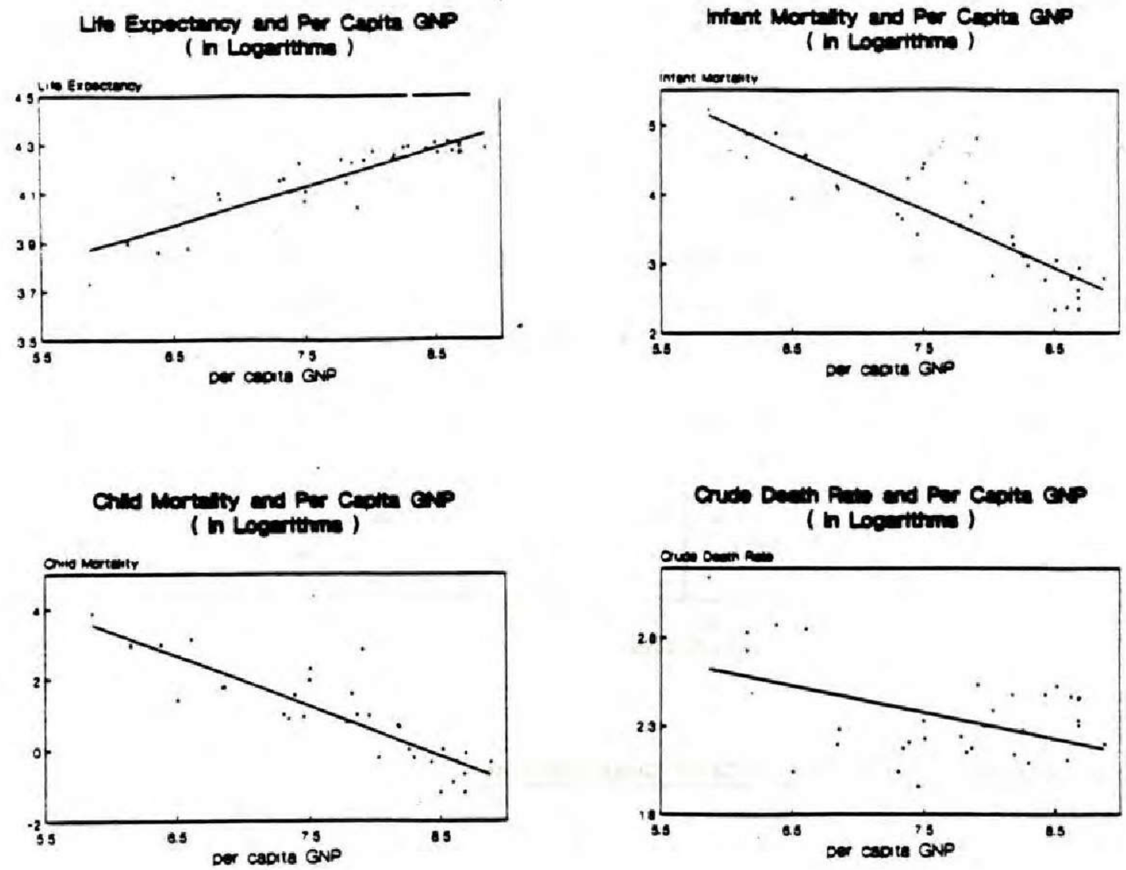
1. Malawi	$ 351	18. Iran	$ 2704
2. Kenya	470	19. Uruguay	2844
3. India	470	20. Ireland	3048
4. Pakistan	590	21. Hungary	3558
5. Sri Lanka	667	22. Poland	3597
6. Zambia	737	23. Italy	3861
7. Thailand	936	24. Spain	4010
8. Philippines	996	25. United Kingdom	4587
9. Korea	1484	26. Japan	4906
10. Malaysia	1540	27. Austria	4994
11. Colombia	1608	28. Netherlands	5397
12. Jamaica	1722	29. Belgium	5574
13. Syria	1794	30. France	5876
14. Brazil	1811	31. Luxembourg	5883
15. Romania	2386	32. Denmark	5910
16. Mexico	2487	33. Germany	5952
17. Yugoslavia	2591	34. USA	7176

1/ Source, Kravis (1982); all data are 1975 US dollars.

These familiar diagrams demonstrate the wide range of health status across countries. Life expectancy at birth ranges from 41.7 years in Malawi to 74.6 years in The Netherlands. Infant death rates range from 10.3 to 184.0 per thousand and the crude death rate ranges from 6.2 in to 23.3.

The diagrams also show the very strong correlation between health and income levels. The associated regression coefficients in Table 2 are all significantly different from zero at a better than 1 percent confidence level and the adjusted R-squares show that, except for the crude death rate, per capita income is a fairly good predictor of health status. The regression results suggest that a 10 percent increase in per capita GNP corresponds roughly with an increase of 1 year in life expectancy, an 8.3 percent

FIGURE 1: Health Indicators and GNP (1975)



reduction in the infant mortality rate, a 14.2 percent reduction in the child mortality rate, and a 1.5 percent reduction in the crude death rate.

Table 2. Regression Results[1]: Health and Development
(T-Values in Parenthesis)

	Life Expectancy	Infant Mortality	Child Mortality	Crude Death Rate
Constant	2.951 (26.84)	10.024 (14.96)	11.851 (11.52)	3.510 (8.75)
GNP, Per Capita	.157 (11.09)	-.833 (9.65)	-1.415 (10.68)	-.151 (2.91)
$\bar{R}^2$	.787	.737	.774	.185

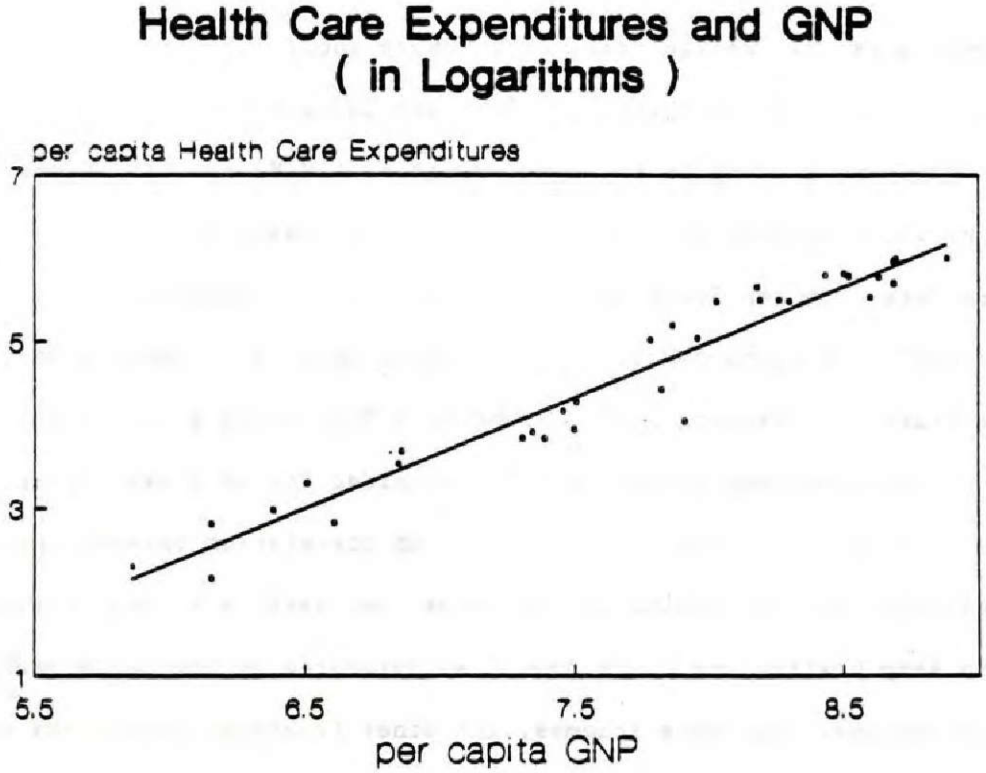
1/ Variables measured in logarithm.

2.2 Development and Health-Care Consumption

Of course, income *per se* does not produce good health. There is ample evidence, both from micro and macro studies, that income is a proxy for improved nutritional status, safer sanitary conditions, better housing conditions, higher education levels, etc. All of these factors contribute, directly or indirectly, to an improvement in overall health status. The most direct intervention that aims at improving health is the provision of medical goods and services.

Figure 2 shows the relationship between per capita health-care expenditures and per capita GNP. Per capita expenditures in this sample of countries range from US$ 8.70 in Kenya to US$ 401.29 in U.S.A. The double-logarithmic Engel curve drawn through the scatter diagram has a R-squared of .942 and indicates that medical care is a luxury good: the income elasticity of total health-care expenditures is 1.329 (see Table 3 below). This perhaps somewhat surprising finding is not new. Musgrove (1978) reports income elasticities about ranging form .81 to 1.34, using household income and expenditure data from ten South America cities. In a subsequent study (Musgrove, 1983), he again concludes that health-care is a luxury good (i.e. the income elasticity exceeds 1.0). Newhouse (1977) using a data set similar to ours, but for developed countries only, obtained income elasticities in the range from 1.13 to 1.31. The persistently high correlation between health-care expenditures and per capita income shows that despite a large variety of efforts "to keep health-care costs down," as evidenced by the large variety of health-care systems, insurance schemes, and other financing mechanisms we find throughout the world, in the end countries consume an amount of medical care that is determined mainly by their level of income.

FIGURE 2:


Health Care Expenditures and GNP
(in Logarithms)
per capita Health Care Expenditures
7
5
3
1
5.5
6.5
7.5
8.5
per capita GNP

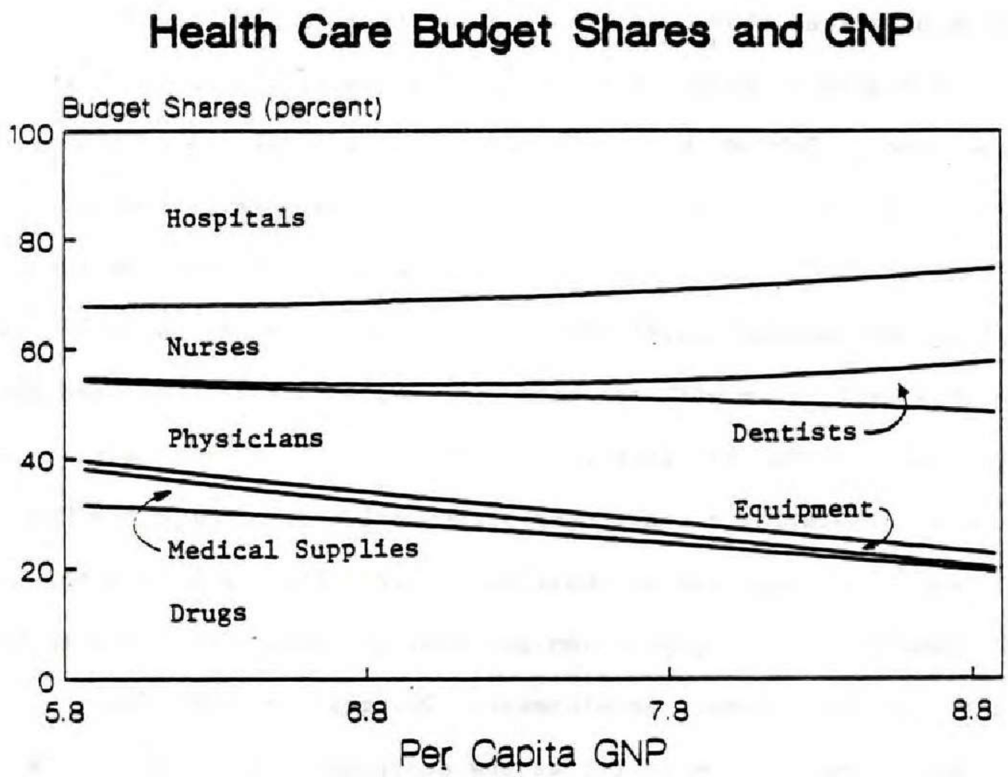
This conclusion foreshadows one of the main issues of the book: how to maintain, and indeed improve a health-care system in the light of constant or contracting resources? As we argue later on, many developing countries face declining per capita GNP's, increasing demands for medical care due to demographic and socio-economic trends, severe budgetary problems and a prolonged contraction of private consumption. Furthermore, their health-care systems already leave much to be desired: hospitals without equipment, doctors without drugs, and rural clinics without safe drinking water or electricity are often the rule rather than the exception. In periods of sustained economic growth, one may expect a more than proportional improvement of the health-care system (at least in terms of expenditures), given the apparently high income elasticity of medical care. But the same result implies that special attention needs to be given to the health-care system in times of economic recession or - at best - zero economic growth (see also World Health Organization, 1987a and 1987b). Where can we find the resources to maintain the current system? How can we generate additional resources to make the necessary improvements? These are the central questions that motivate this study.

Table 3 shows summary statistics and Engel curves (in logarithmic form) for detailed per capita health-care expenditures. Hospitals and physician services form the bigger share, but drugs and nurses also command a sizeable proportion of the total health care budget. With the exception of medical supplies, all items are luxuries in the economic sense: for the luxury items, income elasticities range from 1.361 for hospitals to 2.409 for dental services. The overall income elasticity is 1.329. The variation in

Table 3. **A[illegible]rage Per Capita Expenditures on Health Care and Regression Results: Health Care Expenditures on GNP** (In Logarithms) (T-Values in Parenthesis)

	Per Capita Expenditures			Regression Results				
	Average	Standard Error	Percentage	Constant		Coefficient on GNP [illegible] capita		$\bar{R}^2$
Drugs & Med. Prep.	34.74	45.08	20.7	-6.791	(7.74)	1.276	(11.29)	.793
Medical Supplies	4.27	10.34	2.5	-4.924	(2.72)	.691	(2.97)	.191
Therapeutic Equip.	4.81	7.19	2.9	-11.798	(5.476)	1.613	(5.81)	.499
Physician Services	37.64	49.17	22.4	-9.618	(11.26)	1.627	(14.79)	.868
Dental Services	9.25	13.36	5.5	-17.564	(11.29)	2.409	(12.02)	.813
Nursing Services	28.27	39.23	16.8	-9.084	(10.17)	1.519	(13.20)	.840
Hospitals	49.25	65.73	29.3	-7.272	(6.61)	1.361	(9.61)	.735
Total	168.23	215.81	100%	-5.640	(12.45)	1.3289	(22.77)	.940

FIGURE 3


Health Care Budget Shares and GNP
Budget Shares (percent)
100
80
60
40
20
0
Hospitals
Nurses
Physicians
Dentists
Equipment
Medical Supplies
Drugs
5.8
6.8
7.8
8.8
Per Capita GNP

elasticities implies that the shares within the health-care budget will change with development. We show this in Figure 3 for an average country.

2.3. Health Production Functions

As we have seen above, income is a pretty good predictor for a nation's health status as measured by such crude indicators as mortality rates and life expectancy. Behind this observation lies a large and complex set of factors that, at the micro level, influences individual health status. Aggregated over all individuals one can imagine a health production function that summarizes the complex causal chains that have an impact on individual health. In this section we will estimate the simplest of such an aggregated reduced-form health production function. The nature of the data available prevent us from formulating a convincing structural model that shows how nations, through a rational use of their scarce resources, are able to increase the health of their population and how, in turn, this improved health contributes to further economic development. Our goal is much less pretentious and is in the same spirit as the descriptive analyses of the previous two sections. We want to investigate whether the more than proportional increase in health-care expenditures that accompanies economic growth, contributes to the health of the population, while taking the effects of some other factors into account.

Factors, other than medical care, that come immediately to mind as being relevant to a population's health status are education, overall consumption levels and general living conditions. As a proxy measure for education we use the country's illiteracy rate. We expect private consumption

levels to be of importance especially with regard to food consumption. Average calory intake is used as a proxy for food consumption. The overall living conditions refer to such amenities as access to public services, save drinking water, safe sewerage systems, etc. Though far from being an ideal measure, we will use the population density to represent these factors. The health measures used are the same as those introduced in Section 2, while the consumption of medical goods and services is represented by per capita health-care expenditures (from Section 3). The health production functions are estimated in double logarithmic form. Estimation results are presented in Table 4.

Table 4. **Health-care Production Functions** (T-Values in parenthesis)

	Life Expectancy	Infant Mortality	Child Mortality	Crude Death Rate
Constant	3.110 (5.22)	10.251 (1.80)	4.752 (.57)	.454 (.15)
Literacy	.191 (7.06)	-.400 (1.54)	-.708 (1.88)	-.658 (4.84)
Pop. Density	.009 (1.38)	-.169 (2.54)	-.238 (2.46)	-.007 (.19)
Cal. intake	-.013 (.16)	-.289 (.38)	.538 (.49)	.608 (1.54)
Health exp. Per Capita	.062 (3.56)	-.412 (2.48)	-.868 (3.60)	-.014 (.16)
$\bar{R}^2$	.941	.819	.862	.571

Perhaps the most surprising result of this simple exercise is that literacy stands out as a very important factor related to the production of health. Many studies based on micro data have shown that, for instance, parental education is an important determinant of child health status (Behrman and Wolfe, 1987a and 1987b; Strauss, 1987). Evidence from aggregated data is more scarce, but Cochrane, O'Hara and Leslie (1980) also report strong correlations between adult literacy and child health measures.

If one accepts the population density as an appropriate proxy for overall living conditions, the results show that infant and child mortality rates will fall when these conditions improve. Calory intake does not show any significant effect on health. Most likely, the distribution of food consumption, e.g. calories consumed by the poorest 20 percent of the population, is more relevant to health than the average calorie intake (see, for instance, Behrman and Deolakikar, 1987). The use of national averages obscures the relation between health and nutritional status that has been demonstrated in studies using micro data.

The most important result is the effect of health-care expenditures on health. The estimation results indicate that for a 10 percent increase in health-care expenditures one can "buy" an increase of 0.4 years in life expectancy, a 4.1 percent reduction in the infant mortality rate (from 50.7 to 48.6 on average), and an 8.7 percent reduction in the child death rate (from 6.35 to 5.8). Note that a 10 percent increase in expenditures corresponds to US$1.00 for the poorest country in this sample and to US$16.82 on average. As before, these results imply that special attention needs to be given to the health-care system in times of economic austerity. Just as sustained economic growth can be expected to lead, *ceteris paribus*, to improved health, so is a

decline in per capita income likely to result in a deterioration of the health-care system and a subsequent reduction in health status.[2/]

Despite the plausibility of these results, we would like to warn the reader not to take these estimates as proof that under all circumstances an increase/decrease in health-care expenditures will result in an improvement/reduction of the population's health status. The causal chain that produces good health is a complex one that cannot be adequately analyzed on the basis of aggregated data. However, though health-care expenditures can be wasteful or even counter productive, in general there does exist a direct causal relationship from health-care consumption to improved health. Moreover, our results correspond to those based on studies that mostly using micro data, aim at showing the causal relationships that run from income, education and the use of health services to improved health.

2.4. Government Intervention In The Health-Care Sector

The relationships between health, health-care utilization and development explain, at least in part, the political will of many governments to increase the consumption of medical care, e.g. through subsidies, or by providing health-care free of charge. The expected impact of such an increase in medical consumption, in terms of reduced suffering and an increase in health status (and, thus, productivity) provide a strong justification for interventions in the market for medical goods and services. Our results are

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2/ Cornia et al. (1987) who provided evidence about the deterioration of nutrition and health status (especially among children) during the first half of the 1980s.

consistent with the claim that such government efforts indeed result in a healthier population.

There are many other good reasons why governments should intervene in the provision of (certain types) of medical care. However, not all forms of medical care are equally effective in terms of improving the overall health level of the population. Furthermore, most types of market interventions come at a cost: be it in the form of reduced efficiency or, when the price mechanism is being replaced by some other form of rationing, in terms of undesirable inequity effects. Finally, and perhaps most importantly, governments face budgetary constraints. Without due respect to such constraints, even the best intentions of governments are doomed to fail. It is often argued that the neglect of budgetary realities, combined with other negative side effects of government interventions in the health-care market, account for the dismal state of many health-care system in the developing world.

Still, as stated above, there are several good reasons why the provision of medical goods and services should not be left to market forces alone. First of all, it is well recognized that the consumption of medical care can generate externalities. The most obvious examples of health-care programs that generate large externalities include vaccination programs, sanitation programs, the provision of clean drinking water and medical research. Though not all externalities necessarily call for government interventions, some aspects of medical care, e.g. the control of contagious diseases, are best provided by the government.

Secondly, suffering from a spell of bad health is an uncertain event, making the need to spend on medical care unpredictable. Arrow, in his seminal

article on "Uncertainty and the Welfare Economics of Medical Care" (Arrow, 1963), stressed unpredictability of medical outlays, thus providing the formal argument for the economic (welfare enhancing) efficiency of implementing some form of health insurance. Often such insurance is provided by the government, either in the form of comprehensive public insurance schemes, by providing medical care at subsidized prices, or free of charge.

Finally, but maybe even more important than all previous arguments combined, good health is widely perceived as a basic human right. Financial or other barriers to obtaining medical care are thought to be unethical or at least socially undesirable. This belief has in some countries resulted in the constitutional right for all citizens to obtain medical care fee of charge. In other countries governments have taken the role of the sole provider of medical care, usually with accompanying public insurance schemes. The belief that health is a basic human right also underlies the declaration of Alma Ata that aims at Health for All in the year 2000.

Whatever the motives, the subsequent policy measures all result in a reduction for the consumer of the price of medical care. This price reduction, has lead to two wide-spread phenomena that, in turn, have given rise to more government intervention: moral hazard and supplier-induced demand. Since any type of insurance lowers the price of the insured good to the consumer, at least at the time that the transaction takes place, the consumer has a incentive to buy more of the good than he or she otherwise would (if the good were price elastic). This phenomenon is referred to in the insurance literature as moral hazard and is sometimes said to contribute to the alleged over-utilization of some types of medical care. Regulations to counter this undesirable side-effect of health insurance include compulsory

consulta ns with general practitioners prior to obtaining more expensive speciali c or hospital care.

Supplier-induced demand refers to the possibility that physicians partly pursue their own interests when prescribing treatment for their patients. Since the fully insured patient has no incentive to search for the most cost-effective treatment, and indeed may perceive the most expensive treatment as the best one, the physician may prescribe and deliver the treatment that is most profitable for him. The literature on supplier-induced demand is quite extensive, though far from conclusive (e.g. Phelps, 1986). Measures to reduce the demand increasing effects include compulsory second opinions for major operations and innovative insurance schemes that include incentives for the physician to search for cost effective treatments. (see the extensive literature on Health Maintenance Organizations, HMO's, e.g. Welch, 1985).

The supplier-induced demand hypothesis is closely related to alleged consumer-ignorance in the health-care market. The patient suffering from a disease knows that he or she needs some form of medical care but is usually insufficiently informed to ask for a specific type and quantity drug or treatment. This consumer-ignorance has lead to a wide range of regulatory measures to protect the consumer. Health workers need to fulfill minimum requirements to obtain a license to practice, while medical education is generally provided by the government, or strongly regulated. Drugs can only be marketed after extensive safety testing and a large group of drugs can only be provided by licensed pharmacists.

2.5 Three Categories of Medical Care

In the previous section we showed that there are many special aspects of health and medical care (from sound economic arguments that call for insurance schemes to the ideological position that health is a basic human right) that provide compelling reasons for some form of government intervention in the health-care market. Indeed, the health-care system is among the most regulated industries in most countries in both the industrialized and the developing world. All interventions will, directly or indirectly, alter the price of the good or service faced by the consumer. For instance, market entrance restrictions such as licensing are likely to raise the price of medical care. Most other interventions, however, aim at reducing the price, either through direct subsidies or public health insurance schemes or, in the extreme, the public provision of free medical care. These price reductions will, at least in principle, increase the consumption of medical care and, consequently, improve the health status of the population. Given the importance of health as a public good and as an important in development, this seems a good thing, but it is important to realize that health-care is not a homogeneous commodity. It includes drugs, physician services, hospital and nursing home care, as well as immunization campaigns, sanitation services and health education programs such as advertising the benefits of regular exercises, warnings against the hazards of smoking, and guidelines for food preparation and education on the importance of boiling potentially unsafe drinking water. In the context of discussing the governments role in health-care financing it is useful to present the categorization of health-care provided by De Ferranti (1985). He distinguishes between curative care,

preventive care that is patient related and preventive care that is not patient related. The following table is taken from his study and briefly describes each of these three categories.

The strongest case for providing health-care services free of charge is for the category of non-patient-related preventive services. The argument is a very practical one: since no direct transaction takes place between the supplier of the service (e.g. pest control) and any particular clients, charging individuals who benefit from the service is simply not feasible. If a fee were charged there would be no way of limiting the benefits to those who choose to pay. This non-exclusivity argument implies that some public agent should provide such services, while the costs are covered from general revenues (taxes).

There is, in principle, no problem for charging the cost of medical care to the patient for the second category of health-care services: patient related preventive care. The child being immunized or the mother receiving pre- or antenatal care are readily identified. Still we usually find such services being provided free of charge or well below actual costs. There are two main arguments for this. First, there are externalities to certain types of preventive services that warrant subsidization. The case of contagious disease is the most obvious example. Another focus of preventive measures may be to reduce disabilities that otherwise result in large incidence of support cases to be borne by the community. (e.g. antenatal care to prevent low birth weight that may result in physical or mental handicaps). In such cases also, some form of subsidization can be defended on economic grounds.

TABLE 5. CATEGORIES OF MEDICAL CARE

I. **Curative Care**

Includes personal services (care of patients) by health facilities and independent providers, including traditional practitioners; and purchases by users of medicines. Can be subdivided into:

(i) "first-contact" services (all outpatient)

(ii) referral services (inpatient and some outpatient)

II. **Preventive care: patient-related**

Includes services to well patients, particularly infants, mothers, and pregnant women; also oral rehydration therapy and hypertension control. Delivered through maternal and child health clinics at health facilities and community health programs. Typical services are: immunization, growth monitoring, and instruction on improved breastfeeding and weaning practices.

III. **Preventive care: non-patient-related**

Includes disease control (both vector control and mass campaigns), sanitation, education and promotion of health and hygiene, control of pests and zoonotic diseases, and monitoring of disease patterns.

Source: De Ferranti, 1985, p.67.

The second argument for subsidization of this second category of health services has to do with the fact that the population may not be fully aware of the benefits of the preventive care while society as a whole ("the government") perceives such services to be of major social value. Preventive care is thus thought of as a merit good and measures are taken to increase consumption, e.g. through information campaigns and subsidies, by providing the good free of charge, or even by rewarding those who decide to consume such goods.

The case for subsidizing curative care is by far the weakest. The client is clearly identified and all benefits accrue to him or her. The overriding argument for subsidizing curative care that directly benefits the private consumer has to be the "basic right" argument. It is perceived to be socially desirable that those in need receive medical care and should not have to face financial or other barriers to access to the health care system. Policies to provide medical care to those in ill health, independent of the financial consequences, have taken many forms. In the industrialized world, some governments have sponsored programs for certain target groups (e.g. in the U.S., Medicaid for the poor and Medicare for the aged). Others have public insurance schemes that cover virtually the entire population (e.g. in The Netherlands and Germany) or have nationalized health-care systems (e.g. England, Canada). Similar systems can be found in third world countries but the dominant way of reducing the financial barrier to obtaining medical care is by direct subsidization, up to the point where health-care is provided free-of-charge.

2.6 The Role of Prices in the Health-Care Market

Of course, there is no such thing as "free" medical care. The cost has to be borne by somebody. This cost has two aspects: the cost of providing medical care and the cost of obtaining care. The latter is borne by the consumer and includes not only the fee charged, but also the (opportunity cost of the) time used to travel to the health-care facility, the cost of such travel, the waiting time, etc. Thus, even when the fee is zero, the private cost is positive (and, as we shall see later, can be quite large).

The cost of providing medical care is the sum of all the inputs: wages and salaries of the health workers, equipment drugs, hospital maintenance, etc. If medical care is financed (mostly) out of general revenues, the health-care sector has to compete with other sectors for the scarce government resources. Thus, in the aggregate, the health sector faces a budget constraint and some form of rationing has to take place, even if medical care is provided free of charge.

The many problems facing health-care systems in the developing world (and in many industrialized countries) can to a large extent be traced back by the virtual elimination of price signals in the medical market. On the supply side, investments in both human and non-human capital are no longer guided by relative prices and expected benefits. Rather they are influenced by government subsidies for medical education or stem directly from centrally planned health-care programs. Such programs often show a bias towards high-tech curative care, at the cost of low-cost primary care and preventive measures.

On the demand side consumers no longer face a financial barrier to obtaining medical care, but - given that overall resources are limited - other rationing mechanisms have taken over the place of the price - mechanism. This raises the question of how successful governments have been to increase access to medical care by subsidizing or providing the goods and services free of charge. Who receives the care? How much? How does the rationing take place in the absence of the price mechanism?

A recent World Bank Policy Study analyzed the effect of current financing mechanisms for medical care and points at the internal inefficiency of the health-care sector, as well as at the consequences on the demand side (World Bank, 1987). The conclusion on the latter is that governments have not been successful in providing care to those who need it. The better-off in most countries benefit more from the free or subsidized services than the poor. Rural areas in particular are badly served by public health-care facilities.

This again leads us to the main theme of this book: if the heavy subsidization of medical care in developing countries has not had the desired effect of providing access to those in need, what is the alternative? If governments do not have enough resources to provide adequate medical care to the population, where can additional resources be found? The frequent answer to this and indeed the answer that the World Bank's policy study proposes, is the introduction of user fees back into the system. Of course, the argument against user fees, i.e. they are a potential barrier to access of medical care, is exactly the reason why subsidies or free medical care were instituted in the first place. Thus before such a policy can be implemented a number of questions need to be answered, such as: for which services should fees be

charged; how high should charges be; are patients, especially the poor, willing to pay these charges and how much revenues can be raised? The answers to these questions depend crucially upon the responses of consumers to changes in the price of medical care. Is medical care price elastic? Do patients consider the price of medical care if they are ill? Will patients still use government health-services if a fee is changed? Are the poor more price sensitive than the better-off? What is the price elasticity of medical care?

Surprisingly enough, there is little empirical evidence upon which to base the answer to these questions, especially as they refer to the developing world. This study aims at filling this gap. First, in the next chapter, we will present a descriptive analyses of the health-care infrastructure, health-care financing and health-care utilization patterns in two countries, Peru and Côte d'Ivoire. We will demonstrate that, despite the governments' best intentions (e.g. in Peru, the population has the constitutional right to obtain free medical care from the government), major parts of the population do not have access to modern medical care. Rationing of the limited health-services available takes place not through the price mechanism, but through geographical distribution and queuing.

In the subsequent chapters we explore this issue of non-price rationing to formally define and measure willingness-to-pay for medical care. We will estimate income and price elasticities for medical care and provide answers to the main questions listed above, including those about the effects of user fees on the poor, and the potential for raising revenues. But first we will briefly summarize this chapter.

2.7 Summary

In this chapter we presented two broad reasons for the large role that governments play in the provision of medical care. The first is the strong correlation between development and health. The second set of reasons stem from certain characteristics of both health and medical care. For instance, viewing health as a basic human right explains why one does not want the market mechanism to be the only factor in the provision of medical care. Some of the characteristics of medical care (uncertainty of when and how much is needed, consumer ignorance, externalities, etc.), provide their own justifications for some form of government intervention or financing. Reducing the cost of medical care to the consumer puts the burden of financing care on the government. The severe budgetary constraints faced by many governments in LDCs have caused the results of government policies in the health-care sector to fall far short of expectations.

Medical care takes many forms and the economic arguments for government financing or subsidization are stronger for those types of medical care that are preventive in character than for curative care. Even for some types of preventive care, i.e. those types that directly benefit the specific client, the benefits of subsidization may not always exceed the economic costs. The case for subsidizing curative care, or providing curative care free of charge, is the weakest, at least on economic grounds. However, when good health and access to medical care are considered basic rights, the social benefits of providing medical care free of charge or at highly subsidized prices may well exceed the economic costs, provided, of course, that such policies indeed succeed in eliminating the access barriers to medical care.

In the next chapter we will investigate to what extent the provision of medical care at (close to) zero costs has succeeded in providing adequate medical care to those who need it, independent of their economic means. With this equity objective in mind, we will take a close look at the health-care sectors of Côte d'Ivoire, where medical care is provided free of charge, and of Peru, where we find a variety of health insurance schemes as well as large government subsidies for most types of medical care.

CHAPTER 3

The Health-Care Systems in Côte d'Ivoire and Peru

In the following chapters we will provide a detailed analysis of the demand for medical care in two countries. One in Africa, Côte d'Ivoire, and one in Latin America, Peru. This chapter will present socio-economic information that can serve as background for the subsequent empirical studies. Starting with Africa, we will present some key economic and health indicators and discuss the general organization of the Ivorian health-care system. The second half of this chapter provides the information for Peru.

3.1 Health and Health-Care in West Africa

Côte d'Ivoire is part of the West Africa region that is situated along the coast of the Atlantic Ocean. Liberia and Ghana are its neighbors on the west and east border, respectively, while Guinea-Bissau, Mali and Burkina Faso border the country in the north. Côte d'Ivoire has about 10 million inhabitants of which more than 60 percent live in rural areas.

This West-African region has some of the poorest countries in the world. Benin, Burkina Faso and Guinea-Bissau, to name just a few, all have per capita incomes of well below $300 per year. Health indicators for this region reflect this poverty. Life expectancies as low as 38.4 years are reported by Guinea, Guinea-Bissau and Sierra Leone (Table 1). Infant mortality rates exceed 150 per thousand for many of the countries in this regioń, and are as high as 175 in some countries. Child death rates range from 7.3 in the Cango to 43.5 in Guinea, Mali and Sierra Leone.

Other indicators sketch an equally bleak picture: For instance, most of the countries in this region do not produce enough food to match the daily

calorie intake requirements of the population. Primary school enrollment in six out of the 18 countries listed is well below 50% and the vast majority of the people have no access to clean drinking water.

The last three columns of this Table show basic indicators of the health service infrastructure of these countries. Perhaps the most striking fact here is that so little is known. For one third of the countries such simple measures as the population/physician ratio are not available. The data that are available show a large variation, part of which is likely to be the result of differences in definition. In those low income sub-Saharan countries for which there are data we find just over one doctor for every 40 thousand people, one nurse for every 3300 people and one hospital bed to serve 1700 people. For middle income sub-Saharan countries the numbers are somewhat better, especially with regard to physicians.

Though generalizations have a tendency to obscure rather than to enlighten facts, it seems fair to say that the health-care system in a typical country in West-Africa is badly developed. Indeed, the averages presented in Table 1 do not reveal some of the most serious deficiencies of the health-care systems, such as the skewed distribution of services in favor of urban areas and the poor quality of the services. This poor quality is evidenced by the lack of equipment in hospitals and the lack of drugs in clinics. In general the lack of a sound financial basis has dried up resources for anything but the salaries of the staff. (See Vogel, 1987, for a detailed description of health-care financing in four West-African countries; Senegal, Mali, Ghana and Côte d'Ivoire.)

In the next section we will take a closer look at the health-care system in one West-African country: Côte d'Ivoire.

TABLE 1: <u>Socio-economic Indicators, West Africa; selected countries</u>

	GNP per capita	Life exp. at birth	Infant Mortality Rate	Child Death Rate	% of Calory Require-ments	Primary School Enroll-ment	Access to Safe Drinking Water	Pop. per Physician (Thous.)	Pop. per Nurse (Thous.)	Pop. per Hospital (Thous.)
Gabon	4100	50.7	108.4	21.9	122.2	118.0	-	-	-	-
Congo	1140	56.9	77.8	7.3	109.2	-	25.0	-	-	-
Cameroon	800	54.5	92.0	10.4	87.5	108.0	-	-	-	-
Nigeria	730	49.6	110.4	21.4	85.7	-	-	12.0	3.0	1.6
Côte d'Ivoire	610	52.4	106.0	15.0	111.5	79.0	65.9	-	-	-
Liberia	470	49.9	128.0	23.2	102.5	76.0	-	9.4	3.2	-
Mauritania	450	46.2	133.0	25.2	97.5	37.0	84.0	-	-	-
Senegal	380	46.2	137.6	27.0	102.4	53.0	42.0	14.2	2.2	-
Ghana	350	52.9	94.8	11.3	65.9	79.0	47.0	39.2	3.3	1.7
Guinea	330	38.4	175.6	30.6	97.0	63.0	10.0	8.1	.8	.6
Sao Tome and Principle	330	64.1	60.9	-	96.8	-	80.0	2.8	.7	-
Cape Verde	320	64.1	70.2	12.6	88.9	131.0	50.0	6.3	1.0	.5
Sierra Leone	310	38.4	175.6	43.5	90.5	45.0	16.0	19.3	2.3	.9
Benin	270	49.0	116.0	18.6	82.9	67.0	20.0	17.0	1.7	1.0
Central African Rep.	260	48.6	138.0	27.2	90.6	77.0	-	23.1	2.1	.7
Togo	250	51.5	98.4	12.4	93.7	102.0	42.0	21.2	1.9	-
Guinea-Bissau	190	38.4	175.4	30.6	97.0	63.0	10.0	8.1	.8	.6
Niger	190	43.3	141.6	28.7	96.6	27.0	33.0	-	-	-
Burkina Faso	160	45.2	145.6	30.4	85.0	27.0	30.0	51.6	3.2	-
Mali	140	45.9	175.6	43.5	68.0	24.0	6.0	27.8	2.5	-
<u>Reference Groups</u>										
Low Income Sub-Saharan	219.9	48.2	128.5	25.7	90.0	60.1	25.2	39.2	3.3	1.7
Mid. Income Sub-Saharan	1025.3	51.0	103.2	17.6	94.2	98.5	45.8	11.3	2.6	1.4

Source: Social Indicators of Development, 1986; World Bank.

3.2 The Ivorian Health-Care System

Since independence (1960), the Côte d'Ivoire has seen a steady economic growth, from a level of $145 per capita in 1960 up to $1,207 in 1980, the high point of its economic development. This "miracle Ivorian" resulted from an energetic export-oriented economic policy that made Côte d'Ivoire th number of one world exporter of cocoa and number two in coffee (den Tuinder, 1978). The country's heavy reliance on these two export crops makes it vulnerable to large flunctuations in the commodity prices. After the boom in coffee and cocoa prices during the mid-seventies, the coffee price declined 31 percent and the price of cocoa 10 percent during 1977-78. The government tried to keep the economy in high gear by increasing public investment financed by heavy external borrowing.

The burgeoning external public debt made it clear that this policy could not be continued. A major financial recovery and structural adjustment program was initiated in 1981. Public investment was cut by 21 percent and in 1983 government current and capital expenditures were reduced by an additional 20 percent. The initial consequences for the economy were severe. Employment in the modern sector declined 31 percent between 1979 and 1984 (Newman and Lavy, 1987). Per capita private consumption declined about 35 percent in real terms during the same period. (Table 2)

Though the adjustment measures are beginning to have their intended effects, the short run outlook suggests at least a continued stagnation of the economy in terms of per capita GDP.

Against this background there is little room for major new government initiatives to improve the health-care infrastructure of the country. That

such an initiative is called for is evidenced by the current health status of the population and the status of the country's health-care infrastructure.

Table 2. **Macro Economic Indicators for Côte d'Ivoire**
Selected years, 1965-1984; (CFAF billion, 1984 constant prices)

	1965	1970	1975	1980	1981	1982	1983	1984
GDP	1059.4	1632.3	2225.2	3210.3	3248.1	3123.5	2991.0	2869.3
GDP, Per Capita (CFAx1000)	325.9	415.3	400.9	474.19	379.89	353.55	321.6	293.9
Government Expenditure	-	-	332.6	535.2	501.7	496.4	474.8	442.8
Government Expenditure as % of GNP	-		14.9	16.7	15.4	15.8	15.8	15.4

Since 1960, crude health indicators have improved significantly. The infant mortality rate decreased from 167 in 1960 to 119 in 1982, while life

Table 3. **Health Indicators for Côte d'Ivoire and Lower Middle Income Countries (averages)**

	Côte d'Ivoire		Lower Middle Income	
	1960	1980	1960	1980
Crude Death Rate	24	17	20	12
Infant Mortality Rate	167	119	114	89
Child Mortality Rate	40	23	28	13
Life Expectancy at Birth	39	47	45	56

SOURCE: The Côte d'Ivoire Country Economic Memorandum, the World Bank, 1986.

expectancy at birth increased from 39 to 47 years (Table 3). Still, these indicators are little better than those prevailing in neighboring West African countries which are much poorer, and they compare unfavorably to those of an "average" lower middle income country. Clearly, the development of health-care programs has lacked behind those in countries of similar levels of development.

Large differences of health status exist within the country. In Abidjan life expectancy was estimated at 56 years in 1979, compared with only 39 years in the rural Savanna regions, and 50 years in the urban Savanna regions. Child mortality rates in rural areas were twice as high as in Abidjan. Part of these differences is likely to be related to the unequal distribution of welfare in the Ivory Coast. Based on the value of total household consumption, only 3.3 percent of those in the lowest quintile live in Abidjan, while 45.7 percent of "the poor" live in the Savanna area (Table 4). Just 3.9 percent of "the rich" live in the Savanna, while 42.8 percent of them live in Abidjan. This large, urban-rural welfare gap is paralleled by the distribution of health care infrastructure.

Table 4. **The Regional Distribution of Welfare in Côte d'Ivoire Consumption Quintiles, Percentages of the Population**

		QUINTILES				
	Total	1	2	3	4	5
Abidjan	18.8	3.3	5.2	13.2	29.2	42.8
Other Cities	22.4	7.0	18.1	28.2	27.1	31.8
Rural East	24.7	35.2	35.4	22.5	19.9	10.6
Rural West	15.2	8.8	19.6	21.9	14.9	11.0
Rural Savanna	18.9	45.7	21.8	14.1	9.0	3.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

SOURCE: Glewwe (1987)

About 40 percent of the population in Côte d'Ivoire lives in urban areas. Abidjan alone accounts for a population of 1.6 million, or about 17 percent of the total of 9.3 million (1983). All major hospital facilities are in the cities. The two university hospitals (about 1300 beds in total) are situated in Abidjan, while the five regional hospitals (general hospitals with a capacity of about 275 beds) are found in the cities of Bouaké, Man, Daloa, Abengourou and Korogho. Together these hospital facilities account for 41 percent of all beds. Rural areas are served by small local hospitals, maternity and child care units, dispensaries and mobile health units.

The hospital sector employs 70 percent of all doctors, 45 percent of all midwives and over 50 percent of all nurses. About 60 percent of all doctors are based in Abidjan. The overall health manpower situation is unbalanced. In 1983 there were about 600 doctors, 2200 nurses and 1000 midwives, but virtually no skilled auxiliary workers. Given the current health manpower training system, the number of physicians will increase from

6.5 per 100,000 population in 1983 to 7.8 in 2000. The number of nurses per capita will increase from about 24.9 to 26.5. Thus, the already low nurse/doctor ratio of 3.8 will further decrease to about 3.4.

All health workers are paid by the government. Medical care is, in principle, provided free of charge, though some attempts are under way to introduce user fees for hospital care. However, only an estimated 3.1 percent of total health-care cost is currently covered by user fees (Vogel, 1987).

For 1984 the government health budget was 32.6 billion CFAF, or 6.8% of the total budget down from 7.5% five years earlier. More than 75 per cent of this budget is for personnel cost, about 8 percent for drugs and the rest for materials, equipment, maintenance and other operating cost. Manpower projections indicate that the total health budget will soon be insufficient just to cover personnel cost only, unless the health budget grows much faster than other parts of the government budget, or unless other financial resources are found.

The general quality of the existing facilities leaves much to be desired. A 1979 study showed that of the 309 dispensaries, one third was more than 20 years old, only 19 percent had piped in water and just 21 percent had a working water pump. Of the 126 Maternal-Child Health Care units (MCH), 45 percent had no water and 31 percent no electricity. The two university hospitals in Abidjan have occupancy rates well in excess of 100 percent, but many of the hospitalized patients are just waiting for the arrival of necessary drugs and other supplies and/or for the repair of equipment.

The most recent data on the population's health-status and health-care utilization patterns stem from the Côte d'Ivoire Living Standards Survey, conducted in 1985. In terms of self reported health status, about 30 percent

of the population suffers from an illness or injury during any given four week period (Table 5). No major sex differentials exist, but there is a distinct age profile. Young children (0-5) show an incidence of illness and injury equal to the overall average, while older children (6-15) show the

Table 5. **Percentage of Individuals who Report an Illness or Injury During the Past Four Weeks; by Location, Age and Sex**

	Abidjan			Other Cities			Villages			Côte d'Ivoire		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	30.73	35.22	33.19	30.26	29.93	30.10	32.08	30.05	31.15	31.48	30.98	31.26
6-15	21.99	20.05	20.98	23.03	20.60	21.84	20.63	19.89	20.28	21.43	20.98	20.27
16-35	26.41	32.93	29.86	27.06	31.57	29.70	23.97	26.81	25.61	25.58	29.40	27.69
36-49	40.80	40.32	40.56	44.80	44.59	44.69	46.08	42.27	43.70	44.60	42.40	43.32
50+	32.05	42.00	35.94	57.52	51.22	54.24	54.80	55.73	55.26	52.77	53.09	53.32
Total	27.81	30.79	29.36	30.37	30.77	30.57	30.99	31.21	31.11	30.26	31.03	30.67

lowest incidence rate. Adults (16 and over) show a monotonous increase of illness with age.

Table 5 reflects the anticipated decline in health associated with age: the number of days during which individuals are restricted in their daily activities, due to an illness or injury increases with age. The average number of days in rural areas during which the individual could not pursue his or her normal activities is 7.7 for males and 8.7 for females, compared with little over five days in urban areas. Thus, while the incidence of self-reported health problems appears to be higher in the cities, health problems are on average more severe in rural areas.

Table 6. **Average Number of Restricted Activity Days During the Past Four Weeks; by Location, Age and Sex**

	Abidjan			Other Cities			Villages			Ivory Coast		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	5.57	4.46	4.93	4.73	5.38	5.04	6.11	6.31	6.21	5.74	5.74	5.74
6-15	3.90	4.03	3.97	3.82	3.57	3.71	5.08	4.83	4.96	4.56	4.36	4.46
16-35	3.60	5.52	4.72	3.68	5.63	4.78	7.53	7.32	7.40	5.37	6.40	5.98
36-49	3.88	8.48	6.11	4.47	7.06	5.87	7.50	7.45	6.47	6.07	7.51	6.90
50+	8.36	10.29	9.24	10.17	7.73	8.97	10.97	12.47	11.71	10.66	11.53	11.09
Total	4.45	5.63	5.09	4.95	5.64	5.31	7.52	7.88	7.71	6.40	6.96	6.69

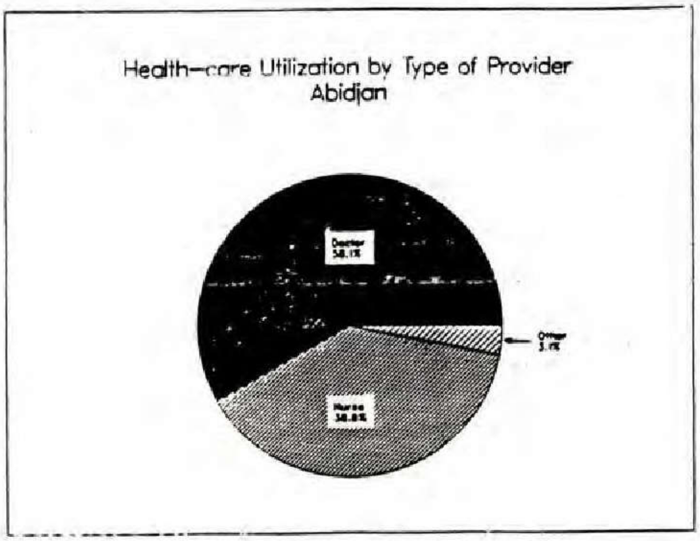
Table 6 shows the distribution of visits to formal health workers i.e. doctors, nurses and midwives. Since obstetric care is included in the table it is no surprise that prime age females usually obtain more medical care than prime age males. In the oldest cohort, where obstetric care is no longer relevant the reverse occurs: elderly females obtain less formal care than elderly males, with the exception of Abidjan. Although the elderly are less healthy than younger adults, they tend to consume less medical care, particularly in rural areas.

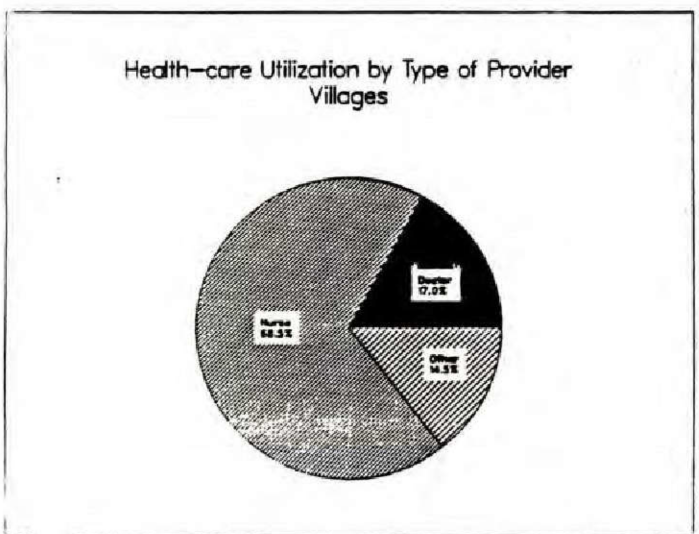
Perhaps the most important result in Table 7 is that in Abidjan 60% of the individuals who report an illness or injury obtain some form of medical care, while only 40% of those living in rural areas do. This quantitative difference in health-care utilization is aggravated by qualitative differences. Figure 1 show 8.1% of the patients in Abidjan are treated by a physician and 38.8% by In rural areas only 17.0% receive treatment from a physician, th majority of the patients, 68.5%, see a nurse.

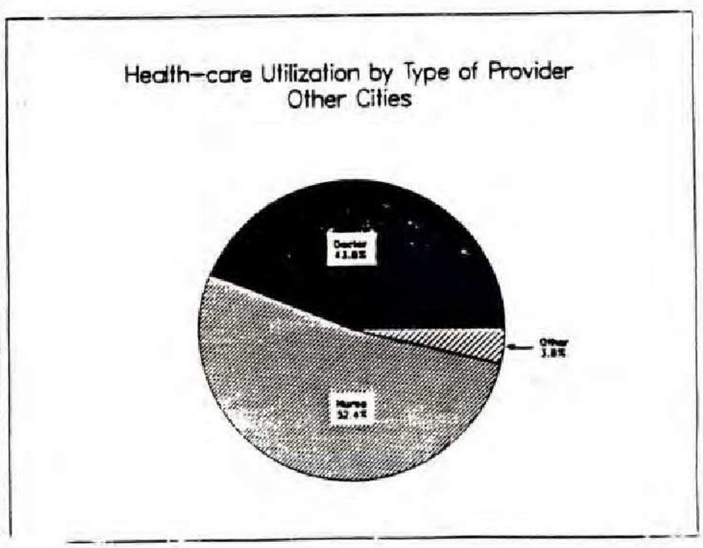
Table 7. **Percentage of Individuals with an Illness or Injury Who Obtained Medical Care**

	Abidjan			Other Cities			Villages			Ivory Coast		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	68.25	68.97	68.67	69.57	60.25	65.00	46.26	41.91	44.36	54.36	51.44	52.99
6-15	50.68	61.64	56.16	50.45	52.08	51.21	41.94	40.85	41.43	45.60	47.64	46.56
16-35	53.95	62.20	58.72	53.85	57.49	55.89	39.59	47.33	44.27	47.52	53.88	51.26
36-49	60.78	68.00	64.36	62.50	59.09	60.66	45.39	38.89	41.46	52.42	47.29	49.48
50+	60.00	47.62	54.35	52.31	46.03	49.22	32.30	31.21	31.76	37.53	34.70	36.14
Total	57.45	63.54	60.77	57.05	55.63	56.32	40.59	40.10	40.33	47.30	47.95	47.64

FIGURE 1:


Health–care Utilization by Type of Provider
Abidjan
Doctor 58.1%
Other 3.1%
Nurse 38.8%


Health–care Utilization by Type of Provider
Villages
Doctor 17.0%
Nurse 68.5%
Other 14.5%


Health–care Utilization by Type of Provider
Other Cities
Doctor 43.8%
Other 3.8%
Nurse 52.4%

The data illustrate the severity of health problems in Côte d'Ivoire. Roughly one-third of the population is ill during any given 4-week recall period and, on average, those who are ill lose about one-quarter of their time due to illness. Health-care utilization is highly skewed in favor of urban dwellers, both in quantity and in qualitative terms. Just 40% of the ill in rural areas receive any type of medical care, most of this is provided by nurses, rather than physicians. Cost recovery is virtually nonexistent in Côte d'Ivoire, the health budget is shrinking as a percentage of the total government budget and the economic outlook for the country shows little if any per capita growth for the foreseeable future. Additional financial resources, other than general government revenues, need to be found, not just to maintain the current situation, but to make the major improvements that are necessary. Introducing user fees are one option. The desirability and feasibility of this option depend crucially on the willingness-to-pay for medical care, the main issue of this study. Our analytical work (Chapter 5), will focus on the determinants of health-care utilization in rural areas; on the basis of which we will estimate the willingness-to-pay for medical care. But first we will present a similar descriptive analyses of health and health-care utilization in Peru.

3.3 Health and Health-Care in Latin America

Peru, situated on the West-coast of the Latin-America continent is a country with a population of over 18 million people. With a *per capita* GNP of about $1000, the country is considerably better off than most of the West-African countries we briefly discussed above. As we show for selected countries in Table 8, this is generally true for Latin America: GNP *per capita* ranges from $1000 to $3410, i.e. well above the African figures, though Bolivia forms a poor exception with $540.

The health indicators are also well above those presented for Africa. (See World Health Organization, 1982, for a more extensive evaluation of health status in Latin American countries. See also Cox and Geletkanycz, 1977, for details on Peru). Life-expectancy in an average middle-income Latin American country is 65.6 years, as compared to 51.0 for a middle-income sub-Sahara country. The average infant mortality rate is 56.1 and the child death rate is 4.0. (Recall from Table 1 that these numbers are 103.2 and 17.6 for middle-income sub-Sahara countries). Primary school enrollment is about universal, but one-third of the population has still no access to safe drinking water.

TABLE 8: Socio-economic Indicators, Latin America; selected countries

	GNP per capita	Life exp. at birth	Infant Mortality Rate	Child Death Rate	% of Calory Require-ments	Primary School Enroll-Ment	Access to Safe Drinking Water	Pop. per Physician (Thous.)	Pop. per Nurse (Thous.)	Pop. per Hospital (Thous.)
Venezuela	3410	69.4	37.8	1.6	99.2	105.0	81.0	1.0	0.5	0.3
Argentina	2230	70.1	34.4	1.3	119.2	107.0	57.0	0.5	0.6	0.2
Uruguay	1980	73.3	28.8	0.9	99.1	109.0	80.0	0.5	0.7	0.2
Brazil	1720	64.1	67.8	5.5	106	102.0	71.0	1.3	1.2	0.3
Chile	1700	70.1	21.8	0.5	105.5	111.0	84.0	1.0	0.5	0.3
Colombia	1390	64.7	48.4	2.7	109.7	120.0	92.0	2.1	1.0	0.6
Paraguay	1240	65.8	43.8	2.2	121.7	103.0	21.0	1.4	0.7	0.7
Ecuador	1150	65	67.2	5.4	89.2	115.0	51.8	2.1	1.1	0.6
Peru	1000	59.3	94.6	11.2	85	116.0	51.0	1.7	0.9	0.5
Bolivia	540	52.5	118.4	19.5	81.8	87.0	37.0	2.0	2.7	0.5
Reference Group										
Mid-Income LAC	1782.8	65.6	56.1	4.3	109.3	107.3	66.3	1.3	1.2	0.4

Source: Social Indicators of Development, 1986; World Bank.

As for the health-care infrastructure, we find on average one physician for every 1300 people and about an equal number of nurses. There is one hospital bed for every 400 people.

Thus, both the health indicators and the data on the health-care infrastructure show a considerably better picture in Latin-America than in sub-Saharan Africa. Of course, this does not come as a surprise, since the countries in sub-Saharan Africa that we discussed belong to the poorest in the world, while most Latin-American countries are middle income countries. Nor does it imply that from a health and medical-care point of view Latin-America is in good shape in absolute terms. For instance, though the infant mortality rate has seen a steady decrease, its absolute value of 56.1 is well above the rates usually found in the industrialized world. Moreover, the greatest proportion of infant mortality is still due to communicable diseases. The Pan-American Health Organization reports that 24 percent of all deaths of children between age 1-4 in Latin America resulted from infectious and parasitic diseases that are preventable by immunization. (Pan-American Health Organization, 1982).

As for the health-care infrastructure, urban-rural inequalities in access to medical care are a major problem. For instance, in Colombia, an estimated six million people, half the population, do not have access to primary care (Zchock, 1979). And, in general, in the battle over the scarce financial resources available for medical care, urban hospital facilities have won over rural primary care facilities and preventive activities.

In the next section we will take a closer look at the health-care systém and its financing mechanism in one Latin-American country: Peru.

3.4 The Peruvian Health-Care System*

The dynamics of Peru's economic growth during the last twenty years have been shaped by two completely different approaches to managing the economy: a period of nationalistic popular reforms from 1968 to 1975 followed by a period of stabilization, structural adjustment, and liberalization from 1975 to 1985.

During the first period, a self-proclaimed Revolutionary Government of the Armed Forces seized power and promised to implement drastic social reforms such as nationalization, agrarian reform, educational reform, worker participation in the management of firms (Comunidad Industrial), and promotion of cooperatives and "social property." It introduced subsidies for oil, gasoline, and basic staple foods; prices of other basic products were also controlled and/or heavily subsidized.

The second period began in 1975 with a coup d'état against the reformist military government. A group of more conservative militarists seized power and called for a return to a more orthodox management of the economy, with more reliance on the private sector. In an attempt to reduce government deficits and disequilibrium in the external sector, the new government drastically reduced subsidies and dismantled several social reforms of the first period. The government was committed to a program of stabilization and the reorientation of the economy toward a free-market strategy of growth. A new civilian government came to power in 1980. Without changing the basic orientation in the management of the economy this

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* This section draws heavily upon Suarez, 1987. We are very grateful to him for allowing us to incorporate his material in this volume.

government began consecutive drastic but unsuccessful stabilization programs. It also began a medium-term strategy of structural adjustment leading toward trade liberalization.

Data in Table 9 show the behavior of some of the macro-economic aggregates during the two periods. During the 1970-75 period of popular reforms, average yearly rate of gross domestic product (GDP) growth was 4.8 percent, slightly below the historically high rate of 5.5 percent a year in the fifties and sixties. With a population growth rate of 2.7 percent a year, per capita income increased at an average rate of 2.04 percent. Also during this period inflation rose from a historically low yearly rate of about 5 percent to 13 percent in 1975 and 30 percent in 1976.

During the 1975-85 adjustment and liberalization period, while the population growth rate declined to 2.6 percent, the average rate of GDP growth dropped to 1.23 percent a year; per capita income declined by an average yearly rate of 1.23 percent. Inflation sky rocketed from 30 percent during the mid-seventies, to 60 percent in 1980, 110 percent in 1984, and 170 percent in 1985. Economic recession was particularly severe during the last five years of the structural adjustment and trade liberalization programs.

Between 1980 and 1985 the economy remained almost stagnant; GDP fell at a rate of 0.7 percent a year, and per capita income declined even faster at 3.4 percent a year. In 1985 income per capita was about 6 percent lower than at the beginning of the seventies.

TABLE 9. **Peru: Gross Domestic Product, Inflation, Population, Per Capita Income, 1970, 1975, and 1980-85**

	1970	1975	1980	1981	1982	1983	1984	1985
Real GDP,(bill. 1980 US$)	6.2	12.2	14.5	16.7	14.4	11.1	10.0	14.2
Rate of growth (p.a. real terms)	5.0	-0.5	0.1	3.1	0.6	-12.5	4.4	1.9
Inflation rate	5.0	13.0	59.2	75.4	64.4	111.2	110.2	169.9
Population (millions)	12.8	14.6	16.6	17.0	17.4	17.9	18.4	18.9
Income Index (1970=100) (real terms)	100.0	110.7	113.9	114.6	112.8	95.9	97.4	96.7

Source: Suarez, 1987.

During the first phase of the military government, after two years of austerity measures and policy reforms (1969-70), the government pursued expansionary fiscal policies. Government expenditures, as a proportion of the GDP, increased from an average of 16-18 percent during previous years to above 20 percent during the early eighties, Table 10. Revenues did not increase in proportion, and domestic and foreign borrowing were heavily used to finance rising government deficits.

TABLE 10. Peru: Public Sector Finances, 1970, 1975, 1980-85
(millions of intis)

	1970	1975	1980	1981	1982	1983	1984	1985
Central Government								
Total Expenditure	42.1	106.7	1046.7	1830.2	2634.0	6048.0	10728.3	23869.0
Total Revenue	38.8	88.6	1008.4	1509.7	2459.6	3732.0	5228.1	21667.0
Deficit	-3.3	-18.1	-38.3	-320.5	-174.4	-2316.0	-5500.2	-2202.0
Total Government								
Expend/GDP (%)	17.5	19.4	21.1	22.1	19.1	23.9	18.8	15.4
Deficit/GDP (%)	-1.4	-3.3	-0.8	-3.9	-1.3	-9.1	-9.6	-1.4

Source: Suarez, 1987.

Government deficits, around 3-4 percent of GDP between 1971 and 1974, increased to 6 percent in 1976 and 7.5 percent in 1977. At this time the government attempted to control government expenditures. Favorable export prices, resulting in additional export tax earnings, were used in part to balance the budget. Thus government deficits, as a proportion of GDP, were reduced to 4.7 percent in 1978, 0.5 percent in 1979, and 0.8 percent in 1980.

During the eighties, amidst a process of structural adjustment and liberalization, inconsistent expansionary fiscal and monetary policies were pursued. From 1980 to 1984 high government expenditures continued; in 1984 total government expenditures represented almost 24 percent of GDP. An unsuccessful reform of the tax system and the economic recession resulting from falling terms of trade led to a drastic reduction of government revenues. Deficits rose sharply from 2.8 percent of GDP in 1980 to more than 9 percent in 1983 and 1984.

Increases in government expenditures have not been uniform for all government functions. Between 1973 and 1981 the most important changes were reductions in the share of government expenditures on such social programs as health, education, housing and community activities. Expenditures for these social programs declined from approximately one-third of the total budget in 1973-75, to less than one-fifth in 1981. In 1981 a single item--other purposes--absorbed the largest proportion of total government expenditures. This item comprises mainly the interest and amortization payments on domestic and foreign public debt. Debt-related payments increased from 10 percent of government expenditures in 1973 to 21 percent in 1981. Estimates for 1984/85 show that these payments represented 25-27 percent of total government expenditures.

Thus, the overall picture of the eighties is that of a government struggling to stabilize the economy. The budgetary pressures are such that expansion of the outlays for the social sectors is virtually out of the question. Return of the economy to the path of sustained economic growth, so illusive during the eighties, is still no in sight.

The implications of these developments for the health-care sector could be severe. Despite major progress during the past decades, much remained to be done to improve the health-status of the population. Table 11 summarizes the evolving pattern of the mortality, life expectancy, and infant mortality rates from selected years from the fifties to 1986. In 1986 average life expectancy at birth is estimated at 60.8 years, which is below the average life expectancy rate of 61.2 years for other Latin American countries and the average of 71 years for the developed countries.

TABLE 11. **Peru: Evolution of Health Status Indicators, Selected Periods (per thousand)**

	1950-55	1975	1980-85	1986
Crude Birth Rate	47.0	39.4	37.0	35.0
Crude Mortality Rate	21.6	12.2	11.7	9.7
Infant Mortality Rate [(a)]	156.0	106.6	99.0	90.5
Fertility Rate [(b)]		5.6	4.9	4.7
Life Expectancy at Birth	44.1	56.5	58.9	60.8

(a) Live birth, up to one year.
(b) Per woman in child bearing age.

Source: Suarez, 1987.

As in most developing countries, the evolution of the life expectancy shows that after a significant increase in life expectancy during the fifties and sixties, the rate of increase leveled off during the last decade. Cumulative increases in life expectancy declined from 13 percent between 1960 and 1970 to less than 5 percent during the last ten years (1975-85). For developed countries life expectancy leveled only after it reached 70 years.

Data also show that whereas both birth and mortality rates have been declining, infant mortality remains high, which is the most important factor explaining the relatively low life expectancy and still high crude mortality rates. Peru's infant mortality rate is about 90 per thousand; it is one of the highest among Latin American countries and is in sharp contrast to the infant mortality rates of the most developed countries, whose rates range from 10 to 20 per thousand.

Given the overall economic outlook, it is unlikely that much improvement in these health indicators can be expected to result from the overall improvement of living conditions that is associated with economic growth. Rather, increased efforts in the provision of medical care are called for, if not to increase the health status of the population then, at least, to protect current levels from the detrimental effects of a further decline in the economy.

Again, the major question is where to find the resources necessary to pay for maintaining and, indeed, improving the current health-care system? Currently, the Peruvian health system is a combination of programs and institutions from government and non-government organizations. The public health-sector, comprising all institutions providing both preventive and curative health services to the general public, has 116 hospitals, 463 health-centers and 1,405 sanitary posts (1983-84, Table 12). Though access to these services is generally free of charge, the regional availability and other forms of non-price rationing (e.g. space availability) effectively reduces the coverage to an estimated 56 percent of the population.

The corporate sector (mainly social security funds, army, police, state owned firms and agricultural cooperatives) covers about 16 percent of the population, while the private sector, with an equal number of hospitals as the public sector, covers just 1.8 percent.

TABLE 12. **Peruvian Health Institutions and Coverage (1983-84)**

	Hospitals	Health Centers	Sanitary Posts	Other	% Pop. Covered
Public Health Sector	116	463	1405	13	56.5
Corporate Sector	98	149	130	0	16.6
Private Sector	116	18	3	4	1.8
Total	330	630	1538	17	74.9

Source: Suarez, 1987.

Although most policy debates on financing health programs concentrate on financing the public health sector, this sector's expenditures represent only about 10 percent of total health expenditures (Table 13). Expenditures of the corporate health sector and private households on health-related goods and services represent about 90 percent of total expenditures. These results show a further need to explore the role that the corporate and private sectors could have in implementing health programs.

TABLE 13. **Composition of Health Expenditures in Peru (around 1980-84)**

Sectors	Coverage	Expenditure US$ per capita	Total Expenditure % of the GDP	Sectorial Share (%)
Public Health Sector	56.5	10 to 17	0.6 to 0.8	10
Corporate Health Sector	16.6	100 to 130	2.3 to 3.1	45
Private Sector	1.8	11 to 20	2.1 to 3.5	45
TOTAL	100.0	55 to 77	5.0 to 7.0	100

Source: Suárez, 1987.

Still, more than half of the population has to rely on public health services, not counting the estimated 25% of the population that has effectively no access to any form of medical care.

The latter is a direct result of the skewed geographical distribution of health-care facilities. Hospitals are heavily concentrated in the metropolitan area and other major cities. Health centers and health posts are better distributed but shortages are still evident, especially in the more remote rural areas (Carrille, 1986). Moreover, health facilities in rural areas show a high degree of deterioration. For instance, in the Cuzco and Cajamarca regions health facilities function at less than 50 percent of their capacity due to deteriorated equipment, while 80 percent of the health posts do not have water and sewage facilities (op cit., p.19).

The skewed distribution of health-care facilities mimics the overall distribution of welfare. Average per capita income in Lima was 770 intis per month in 1985/86, but less than half of that in the rural Sierra area (Table 14). Only 6 percent of the poor live in the metropolitan area, and over 50 percent live in rural Sierra, though both areas have approximately the same population.

TABLE 14. **The Distribution of Households by Quintiles**
(percentages)

Characteristics	All Peru	Quintile (Lowest) 1	Quintile 2	Quintile 3	Quintile 4	Quintile (Highest) 5	Mean Expenditure Per Capita (Intis per month)
Region							
Lima	26.8	6.0	18.2	28.8	35.4	45.5	770.9
Coastal Urban	15.2	11.1	14.7	17.6	15.4	17.2	569.8
Coastal Rural	7.2	8.8	9.8	7.2	6.8	3.5	421.3
Sierra Urban	11.0	9.0	9.6	10.2	11.5	14.8	649.9
Sierra Rural	30.5	52.8	38.5	28.1	22.9	10.4	366.8
Selva Urban	3.0	2.1	2.8	2.3	3.0	4.7	792.0
Selva Rural	6.3	10.3	6.5	5.8	3.9	413.5	
	100.0	100.0	100.0	100.0	100.0		

Source: Glewwe, 1987.

TABLE 15. **Percentage of Individuals with an Illness or Injury in Peru; by Location, Age and Sex**

	LIMA METRO			OTHER URBAN			RURAL			PERU		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	62.23	64.06	63.16	49.53	50.59	50.05	41.67	42.57	42.10	47.61	49.17	48.37
6-15	40.36	45.18	42.71	30.85	33.12	31.97	29.57	32.40	30.95	32.41	35.52	33.93
16-35	40.13	47.64	44.01	32.80	39.52	36.28	32.13	36.45	34.35	34.88	40.94	38.01
36-49	47.15	60.31	54.22	40.68	52.03	46.53	41.42	53.51	47.50	42.74	55.09	49.11
50+	51.68	62.84	57.46	46.35	63.97	55.46	57.61	65.49	61.88	53.25	64.42	59.02
Total	45.36	53.01	49.27	37.45	44.19	40.48	38.00	42.96	40.48	39.76	45.98	42.89

TABLE 16. **Average Number of Restricted Activity Days During the Past Four Weeks; by Location, Age and Sex**

	LIMA METRO			OTHER URBAN			RURAL			PERU		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	2.12	1.80	1.95	2.50	2.30	2.40	3.12	2.96	3.04	2.70	2.47	2.58
6-15	1.62	1.09	1.35	1.32	1.40	1.36	2.01	1.98	1.99	1.72	1.57	1.64
16-35	1.38	1.26	1.31	1.87	1.64	1.74	2.31	2.10	2.20	1.85	1.66	1.74
36-49	1.70	1.86	1.80	1.84	1.66	1.76	2.85	2.59	2.70	2.27	2.13	2.19
50+	1.64	3.06	2.44	2.42	3.47	3.05	3.98	3.46	3.70	3.06	3.36	3.23
Total	1.64	1.70	1.67	1.96	2.05	2.01	2.84	2.62	2.72	2.26	2.18	2.28

Table 15 and 16 show the percentage of people who report an illness or injury and the number of restricted days of those who are ill, respectively. The patterns are similar to those in Côte d'Ivoire: the

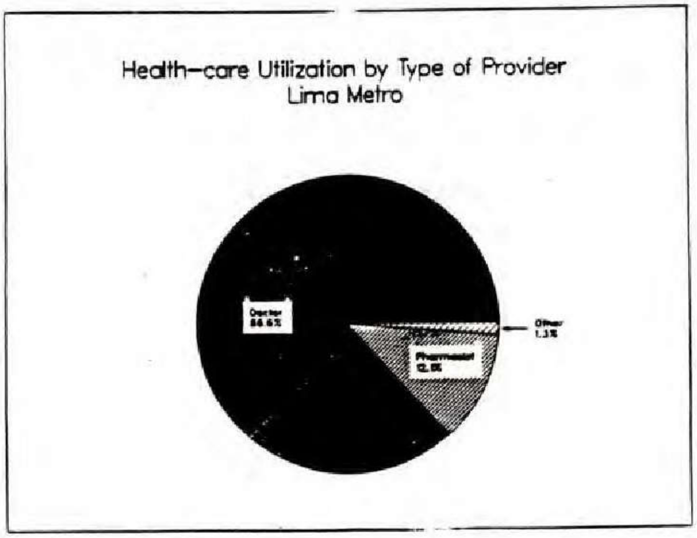
incidence is higher in urban areas, but the severity of il ess is higher in rural areas.

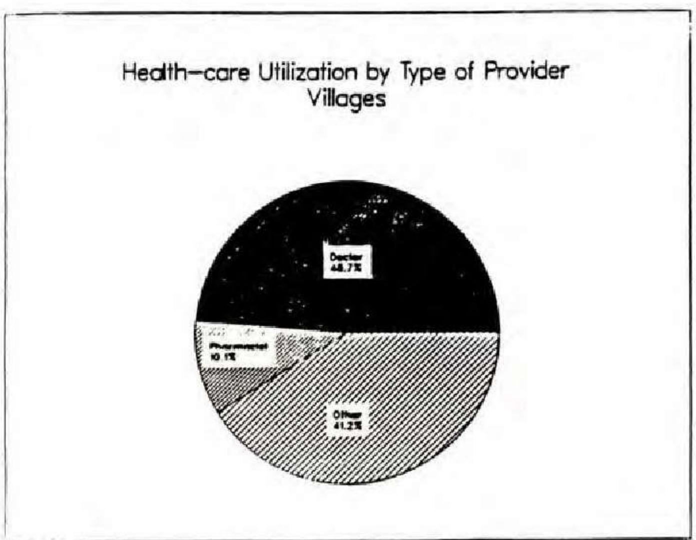
Almost half of the ill or injured in Lima receive some form of medical care, but the number for rural areas is less than 30 percent (Table 17). This quantitative differential is aggrevated by qualitative differences. Over 85 percent of medical care in Lima is provided by doctors. In the rural villages less than half of the patients receive their medical care from a physician, 10 percent receive it from a pharmacist, while 48 percent obtain care from a doctor (Figure 2).

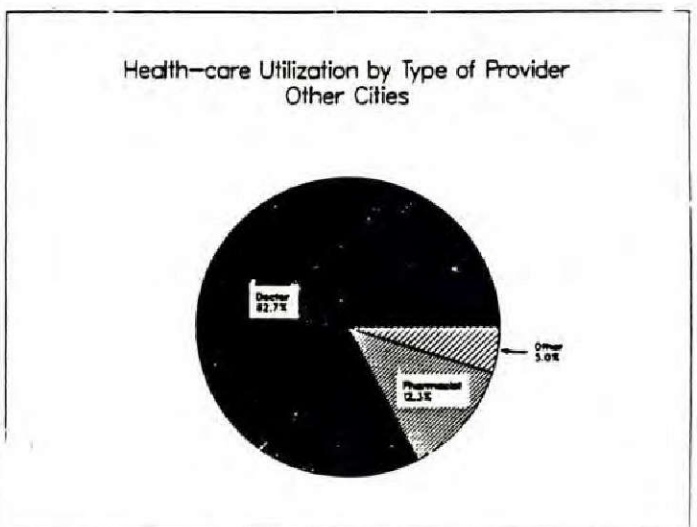
TABLE 17. **Percentage of Ill Individuals Who Obtained Medical Care; by Location, Age and Sex**

	LIMA METRO			OTHER URBAN			RURAL			PERU		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	58.76	56.83	57.76	53.38	53.67	53.52	31.31	29.74	30.55	44.01	43.46	43.73
6-15	49.25	36.52	42.69	32.90	38.49	35.74	26.05	21.70	23.82	34.50	30.34	32.37
16-35	46.96	44.02	45.32	45.53	45.91	45.74	30.90	29.29	30.02	40.83	39.50	40.09
36-49	43.00	54.40	49.81	52.51	50.62	51.42	33.02	34.37	33.78	40.88	44.79	43.14
50+	53.48	55.48	54.61	51.23	47.00	48.71	32.93	30.20	31.43	42.05	40.77	41.33
Total	49.90	48.05	48.88	46.00	46.62	46.34	30.61	28.79	29.64	40.25	39.40	39.79

FIGURE 2:


Health-care Utilization by Type of Provider
Lima Metro
Doctor
86.6%
Pharmacist
Other
1.3%


Health-care Utilization by Type of Provider
Villages
Doctor
48.7%
Pharmacist
10.1%
Other
41.2%


Health-care Utilization by Type of Provider
Other Cities
Doctor
82.7%
Pharmacist
Other
5.0%

In sum, the evidence calls for major improvements in the Peruvian health-care system, especially in rural areas. At the same time, the overall economic outlook calls into question the future availability of government resources to make those improvements. The large urban/rural differentials suggest that there is room for redistributional policies to partly improve the rural health-care system. The introduction of user fees may be another option.

3.5. **Summary**

In this chapter we discussed the health-care systems in two countries, Côte d'Ivoire and Peru, against the background of the overall macro-economic situation. The two countries are very different and are situated in vastly different continents. Still, a number of similarities emerged that are relevant to this study. First, both countries pursued a health-care policy in which the government provides medical care free-of-charge. In Peru, the corporate and private sector complement the public sector in urban areas, but in rural areas the population still has to rely merely on government provided services.

Second, the economic situation in both countries puts sever constraints on the government budget, making it all but impossible to increase the health budget in order to provide additional resources for expanding the medical system. Third, most public services accrue to the better-off urban dwellers, while the rural population has limited access to public facilities. Moreover the quality of these facilities leaves much to be desired.

All evidence makes it painfully obvious that additional resources are necessary to provide medical care of sufficient quality to rural areas. Resources that can not be found in the government's budget. Are user fees the answer? For urban areas, or - more precisely - for better-off households in urban area, the answer to this question seems clear. There are no clear theoretical arguments in favor of across the board subsidies for curative care. Given the very limited resources available to provide medical care, it makes sense to charge those consumers that can afford it for medical goods and

services provided by the government, especially for curative care. Public resources thus saved could be used to help upgrade rural health-care facilities and subsidize care for the rural poor. But should user fees also be charged in rural areas for primary care facilities? In the rest of this book we will try to answer this question, based on detailed empirical analyses of the general health-care utilization patterns presented in this chapter. In the next chapter we will first make the issues related to health-care financing more precise and then present the general theoretical framework on which the empirical analysis will be based.

CHAPTER 4

Analytical Issues in Health-Care Financing

4.1. Introduction

As became clear in the previous chapters, health-care systems in the developing world face a multitude of problems that can not be solved overnight. Many of these problems will not be discussed at any length in this volume. They include questions related to the overall "optimal" outlay for medical care - as compared to, say, expenditures for education or railroads - the appropriate mix of public and private expenditures for medical care, the apparent need to shift resources from curative to preventive care, the desired curricula for health workers, the balance of payments implications of drug imports, etc. High on the list of major problems that urgently need to be dealt with is the question of how to finance medical care. How can sufficient resources be generated to maintain a health-care system of acceptable quality, without putting up financial barriers that deny access to the system to all but the richer few? This is the issue that we address in the rest of this volume, with a focus on curative primary care in rural areas.

This chapter discusses how various aspects of this problem can be approached analytically. Section 2 discusses options for resource mobilization and especially the pro's and cons of introducing prices (user fees) into the system. We will show, in general terms, how the issues of equity and efficiency that are implicit in these options can be addressed empirically if we improve our knowledge of the determinants of the demand for medical care, especially regarding the effects of income and prices.

Section 3 formalizes this discussion. It introduces the general framework used by economists to conduct the type of welfare economics that is called for, provides a formal definition of the willingness-to-pay for medical care and shows how - armed with a properly specified model of the demand for medical care - we can answer such questions as how much revenues can be raised or who wins/loses under various policy scenario's. The theoretical apparatus thus developed will be applied in the following chapters to empirically address these issues using data from Peru and Côte d'Ivoire.

4.2. Alternative Options For Health-care Financing

In the previous chapter we showed the dismal state of the health-care systems in two developing countries, Côte d'Ivoire and Peru. We argued that, in general, the way in which these countries finance their health-care systems has contributed to the problems. In this respect these two countries are not exceptional. The World Bank Policy Study on Financing Health Services in Developing Countries states:

> "Problems in the health sector in developing countries can be summarized under three headings; allocation-insufficient spending on cost-effective health programs; internal efficiency-wasteful public programs of poor quality; and inequity-inequitable distribution of health services" (World Bank, 1987, p.13)

The fundamental cause of these problems is identified as "poor approaches to financing". As we have seen, the vast majority of financial resources for health services comes from government revenues or other general funds (such as social security plans), (see also Jimenez, 1987; Katz, 1987). Only a tiny fraction of the cost is recovered from direct payments by the

consumers. If one could increase count on sustained economic growth, a rapid increase in the government budget for health-care may help to sustain the current health-care infrastructure, to make the necessary quality improvements and to expand the system to meet the needs of the growing and aging population. However, the economic outlook of most developing countries show sluggish growth at best, while the global reevaluation of the role of governments in the process of economic development calls for less rather than for more government expenditures.

Thus, the question is not whether additional resources, other than government revenues, need to be found to strengthen the financial basics of the health-care system, but where and how. When government funds are insufficient to provide medical care for those in need, there is only one alternative: charge the consumer.

This dichotomy between government financed medical care and user charges is somewhat artificial. First of all, the government needs revenues to cover its expenditures, revenues it obtains by taxing the citizens. The inequities of the various tax systems in developing countries (as well as in the industrialized world) warrant a study of their own, but this is beyond the scope of this volume. Secondly, consumer's can pay for the goods and services in various ways, either directly at the time of consumption, or through pre-paid private insurance or compulsory public insurance schemes. If in the latter case health-care is provided free of charge, the difference to the consumer, between government financed and privately paid (but fully insured) medical care is negligible. Indeed such a system is likely to suffer from many of the same problems that characterize a government financed system. Though, of course, in the fully insured health system prices can still play a role, for instance as incentives to the provider to improve efficiency.

In sum, there is a continuum from a system that is completely financed by the government, and in which prices do not play any role, to a completely market oriented system in which prices are used by consumers and producers to allocate the scarce resources available for medical care. We will use the fully government funded health-care system as an extreme case and compare it with one in which additional revenues are raised through user charges.

As stated in Chapter 1, this study is not concerned with the effect of prices on the suppliers of medical care; our focus is on the effects of prices on the consumer. Money prices faced by the consumer can be changed by increasing or decreasing government subsidies or by altering the insurance coverage. But, as we will argue below, money prices are not the only relevant cost to the consumer; other private costs - such as travel cost and lost time for traveling and waiting - also are important.

The main question we will try to answer in the next chapters is: are user fees a viable alternative to government revenues for financing medical care? The answer to this question depends ultimately on the weights one attaches to the equity and efficiency consequences of introducing user fees. These weights reflect the government's preferences or social welfare function. It is unlikely that they can be determined empirically with reasonable precision. What can be determined empirically is what is likely to happen, both in terms of equity and efficiency, if a policy is implemented that introduces user fees or reduces subsidies in a system that previously provided medical care free of charge (or at highly subsidized prices).

The first set of questions that need to be answered is: how do demand patterns change as a result of such a policy? Will people make more/less use of certain health-care providers? Who will opt out of the system, either by not consuming medical care at all or by substituting away from the public system to private providers?

The second set of questions pertains to the welfare consequences of the policies (again, from the consumer's point of view). Who's welfare will be increased/decreased by the fee policies? Are the poor being more/less effected than the rich? Are these options to off-set the negative welfare effects?

Finally we need to address the resource mobilization question. Since, the proposal to raise user fees is motivated by the general lack of financial resources for the health-care system, the question arises whether those fees can be set high enough to raise the revenues necessary for improving the health-care system.

The answer to all these questions depend ultimately on the consumers' reactions to such policies. To be more precise, if prices are irrelevant for the consumption of medical care, i.e. if patients demand medical care only on the basis of their medical needs, irrespective of the economic costs, it makes imminent sense to set the fees equal to their marginal costs. In that case one can obtain full cost recovery without welfare implications. This, of course, is an unrealistic example. Consumers are sensitive to prices, even in the case of medical care (that is exactly why medical care is provided free of charge or as subsidized prices).

Thus the questions boil down to how sensitive consumers are to price changes, how this differs for households in different income groups and which

other determinants of the demand for medical care are important and can, perhaps, be used to off-set some of the negative effects.

In the next section we will show how the economic tools of demand and welfare analyses can be used to answer these questions empirically.

4.3. The Welfare Analyses Of Health-care Demand

The starting point for an economic welfare analysis is a decision making unit that, given limited resources and other constraints, tries to maximize it's own welfare. This welfare maximizing unit is usually an individual or a household, but the general theory can equally well be applied to a government, a firm or a hospital. If the unit is a firm "welfare" could be equated to "profits", which are observable. In that case, the decision problem boils down to one of profit maximization. If the unit is a household or individual, welfare is less easily defined. Indeed analysts make do with a vague notion of welfare, or "utility", that is not measurable but is assumed to be derived from the consumption of goods and services. In its most general form "goods and services " can include leisure or savings but also such intangibles as good health. Consequently the empirical counterpart of this theoretical frame work is the consumption of a bundle of goods and services that either directly contributes to welfare, or indirectly, for instance because they contribute to good health which in turn contributes to welfare.

Thus, households are assumed to choose the bundle of goods and services that maximizes their welfare. The constraint they face is their command over limited resources. Furthermore, they are guided in their choices by the relative prices of the goods and services under consideration. The

analyst observes the household's consumption behavior, the household's total income and the prices in the market. Given the theoretical welfare maximizing framework, these data suffice to make inference on the relative levels of well-being of the households and thus on how these welfare levels change under various policy scenario's. These policy scenario's usually take the form of a change in relative prices or a change in income. We will show below that, prices should be interpreted broadly to include, for instance, the cost of time spent to obtain the good. But first we will formalize this general framework for welfare analyzes.

We will denote a vector of K goods and services as $x = (x_1, x_2, \ldots, x_k)$. Their respective prices are $p = (p_1, p_2, \ldots, p_K)$, and a household's total income is Y. Households are assumed to maximize a utility function U, defined over a bundle of goods and services x, when prices are p and income is Y. In formula:

$$\max_{x} U = U(x_1, x_2, \ldots. x_K) \qquad (1)$$

$$\text{subject to } Y = \sum_{i=1}^{K} p_i x_i$$

The budget constraint says that total expenditures cannot exceed total income.

The result of this maximization problem is the bundle of goods and services chosen by the household. The amounts consumed of each item depend in general on income and all prices. This set of demand equations can be written as follows:

$$
\begin{aligned}
x_1^0 &= x_1(Y, p_1, p_2, \ldots, p_K) \\
\vdots \\
x_i^0 &= x_i(Y, p_1, p_2, \ldots, p_K) \\
\vdots \\
x_K^0 &= x_K(Y, p_1, p_2, \ldots, p_K)
\end{aligned}
\qquad (2)
$$

where x_i^0 denotes the optimal quantity of consumption item i.

Substituting (2) into the utility function (1) yields a so-called indirect utility function:

$$U^0 = U^0 \ (Y, p_1, p_2, \ldots p_K) \qquad (3)$$

This function shows the maximum welfare level, U^0, that can be reached with income Y, when prices are p. The most useful tool for welfare analyses is the inverse of this function:

$$Y = C(U^0, p_1, p_2, \ldots, p_k). \qquad (4)$$

This function, called a cost function, shows how much income is needed, Y, to obtain a given welfare level, U^0, when prices are p.

Since this cost function answers the question of <u>how much</u> does it cost (how much income is needed) to obtain a given welfare level when prices are, say, p^0, it can also show <u>how much more</u> it will cost if we raise prices to p^1. Thus, with the use of equation (4) we can calculate the additional income a household needs to stay at the same welfare level when prices move

from p^0 to p^1. This amount is in the economic literature known as the compensating variation (e.g. Deaton and Muellbauer, 1980).

Let us compare two situations, the only difference between the two is a change in the price of good i, from p_i^0 to p_i^1. Before the price change the cost function reads

$$Y^0 = C(U^0, p_1, p_2, \ldots, p_i^0, \ldots, p_K) \tag{5}$$

after the price change we have

$$Y^1 = C(U^0, p_1, p_2, \ldots, p_i^1, \ldots, p_K) \tag{6}$$

In order to compensate a household for the welfare loss incurred by raising one of the prices, we need to pay the household the amount of $(Y^1 - Y^0)$ the compensation variation. We will now show how this theoretical framework can be used to address the main questions of this study.

Let p_f be the fee for obtaining medical care and p_t be the sum of all other costs (travel time, waiting time, travel costs, etc.), then

$$p_m = p_f + p_t \tag{7}$$

where p_m is the total costs of medical care.

Equation (7), simple as it is , will play a major role in our subsequent analyses. First of all, as we will show in Chapter 5, it will allow us to obtain price elasticities for medical care even when p_f, the user fee, is zero. Secondly, it will allow us to address such questions as: if we

increase the fee for care, p_f, how can we compensate for the corresponding welfare loss (e.g. by reducing various aspects of p_t)? The issue of welfare compensation will be addressed with the help of equation (4), the cost function.

If p_i^0 in equation (7) represents the total cost for medical care, i.e. the sum of the fee p_f and the private costs p_t, and p_i^1 in equation (6) is the new total cost, resulting form the reduction in p_t and and increase in p_f, then $(Y^1 - Y^0)$ is the amount of money that leaves the household equally well-off in both situations. In other words, the compensating variation $(Y^1 - Y^0)$ is the maximum amount a household is willing to pay for the improved access (e.g. reduced travel time) to a clinic or hospital.

This willingness-to-pay notion is exactly what is needed to discuss the welfare effects and revenue potential of introducing (or increasing) user fees for social services. It should be sharply distinguished for someone's ability-to-pay. This latter notion is sometimes used in reference to the consumption of other goods, mostly luxuries such as alcohol or theatre tickets. As long as someone's expenditures on such luxuries exceed the expected costs of medical care, it is judged that he or she is able to pay for medical care.

Unfortunately, someone's ability to pay is only relevant for policy evaluations if one can coerce the person into consuming the goods or services. In the more common situation where one has to rely on people's choices, we can infer from observed consumption patterns whether one is willing to pay for the goods or services.

This completes the theoretical framework necessary to formally address some of the issues discussed in the previous section. The empirical

work starts with the observation of these consumption patterns, i.e. with the estimation of the system of demand equations given in (2). Of course, many factors other than income and prices influence the demand for goods and services. For instance, if the analyses take place at the household level, the size of the household needs to be taken into account. Or, if the focus of the analysis is on any specific item (such as medical care), factors such as education, sex or the age of the individual will play a role. If we denote all such intervening variables by $h=(h_1,h_2,\ldots,h_L)$, we can write the vector of demand equations as:

$$x = x(Y,p;h) \tag{8}$$

This system of demand equations can be estimated from household survey data, provided that sufficient variation in the price vector p is observed. That is often not the case. However, as stated above, prices should be interpreted broadly; the cost of obtaining medical care is not only the fee to be paid to the doctor, but also includes the time and cost of traveling to the clinic or hospital as well. These private costs are specific to the household or the individual. Thus, even when money prices (fees) are the same for all individuals, the total cost of obtaining care is likely to vary. It is this variation in the individual cost of obtaining medical care that allows us to estimate price responses even if money prices (fees) are zero. Subsequently, the price responses will allow us to perform the necessary welfare analysis, as outlined above.

4.4. Summary

This chapter provided a brief introduction to, the economic tools necessary to answer questions related to the effect of user fees on the demand for medical care and the subsequent welfare and budgetary implications. The theoretical framework provided a precise definition of the willingness-to-pay for medical care. We argued that willingness-to-pay and not ability-to-pay is the appropriate criterion to judge the feasibility and desirability of alternative pricing policies.

The theoretical framework also serves as a guide for the subsequent empirical work. First, using observations on current consumption patterns of medical care, demand equations need to be estimated to quantify the influence of such variables as income, price (including travel time, etc.), education, family size, etc. Secondly, on the basis of these demand equations, price elasticities can be calculated that show how price sensitive consumers are, and how this price sensitivity differs among various consumer groups. Finally, armed with this empirical evidence, the tools of welfare economics can be used to quantify the welfare and budgetary implications of various policy scenarios.

In Chapters 6 and 7 we will systemmatically go through these three stages of empirical work. But first we will further specify the analytical framework in order to make it more suitable for studying the determinants of the demand for medical care. Our starting point is the literature on health economics, especially as it focusses on the role of income and prices.

CHAPTER 5

Modeling the Demand for Medical Care

5.1 Introduction

As discussed in Chapter IV, evaluation of the feasibility and desirability of a user fee plan requires an *ex ante* evaluation of the utilization, revenue, and welfare consequences. This, in turn, requires knowledge of the properties of the demand function, especially price elasticities and the effects of other non-monetary costs such as travel time. The price elasticities provide information about how user fees will affect utilization and revenues. Travel time effects can be used to measure the amount individuals are willing to pay for improved access (reduced travel time). If governments open new social service facilities in rural areas, (thus making people better-off by improving access), then the willingness-to-pay is the maximum price increase that can be charged for these facilities without making individuals worse off.

The usually straight-forward exercise of demand estimation is greatly complicated for the case of health care by the fact that there is often little or no price variation within a country. In many developing countries the vast majority of medical services are run by governments who set prices close, and in many cases equal to zero. Even when prices are positive, they are typically uniform within the country. A second complication in modeling the demand for medical care is that the decision to use services is discrete. For example, individuals choose whether to visit a clinic, hospital, private doctor or not to obtain care at all (i.e. treat themselves). A third issue, and one that is not restricted to medical care, is that the effects of user

fees are likely to vary by income so that the distributional consequences must be considered. Indeed, if the poor are more price sensitive than richer individuals, user fees will reduce the utilization by the poor more than by the rich. In this case, uniform user fees would be regressive.

In this chapter we derive a discrete choice specification of the demand for medical care from a utility maximizing theoretical model and show how private time-price variation can be used to identify the parameters necessary to compute price elasticities and willingness-to-pay measures (compensating variations). The model makes use of the well known result that private prices, such as the opportunity cost of time, ration the market when monetary prices are absent or small (Becker, 1965). An added advantage of the model is that the theoretical framework naturally leads to an empirical specification that is flexible enough to allow the price elasticities and willingness-to-pay measures to vary by income levels.

The chapter is organized as follows. A review of the literature on the demand for medical care is provided in the next section. Then, a theoretical model of medical care provider choice in derived, and it's empirical counter-part specified.

5.2 Evidence from the Literature

The early literature on the demand for medical care in developing countries suggests that prices are not important determinants of medical care utilization. Akin et al. (1984, 1986), Schwartz (1988), Birdsall and Chuhan (1986), Heller (1982), all report very small and sometimes positive price effects, most of which are statistically insignificant. More recent work by

Mwabu (1986 and 1988), Gertler, Locay, and Sanderson (1987), Alderman and Gertler (1988), and Cretin, Keeler, Williams and Shi (1988) conclude that prices are important. All of the above studies except for Cretin et al. are discrete choice provider modes. The Cretin et al. study examined household medical expenditures in China and report that differences in coinsurance rates explain one-third of the variation in medical care expenditures.

The results of the early studies contrast sharply with most recent studies on the demand for medical care in developed countries which uniformly conclude that prices are important determinants of medical care utilization. The most important and comprehensive of these studies is the Rand Corporation's National Health Insurance Study (HIS), which was a 5 year controlled randomized trial experiment conducted in five sites in the U.S. with over 20,000 individuals (Manning et al., 1987). The HIS provides overwhelming evidence that prices are statistically significant determinants of health-care utilization. Price elasticities are found to be of the order of -.2. Moreover, the HIS results are on the low end of the prices elasticity estimates from the non-experimental literature, which finds statistically significant price elasticities ranging from -0.2. to as high as -2.1 (For example see Rosset and Huang, 1973; Davis and Russel, 1972; Phelps and Newhouse, 1974; Goldman and Grossman, 1978; Colle and Grossman, 1978; Newhouse and Phelps, 1974 and 1976).

The divergence between the literature on developed and most developing countries is somewhat paradoxical. Indeed, one would expect prices to be less important in the developed world than in the developing world. Two reasons are immediately apparent: (1) income levels are substantially higher in the developed world, and (2) medical care insurance is almost universal in

the developed world and is virtually non-existent in developing countries. Higher income levels and pervasive insurance coverage imply that medical care is a much smaller percentage of budgets in the developed world than in the developing world. One would expect individuals to be more sensitive to prices when these prices are bigger shares of this budget.

In addition, evidence from estimated income elasticities suggests that price elasticities should be higher in developing countries. We know, from the Slutsky decomposition of the price elasticity of demand that the price elasticity increases with the income elasticity, ceteris paribus (e.g. Deaton and Muellbauer, 1980). The empirical evidence shows that the demand for medical care is more income elastic in the poorer-developing countries than in the richer-developed countries. Engel curve estimates for medical care in Birdsall and Chuhan (1983) and Musgrove (1983) report income elasticities close to unity, whereas income elasticities between .2 and .3 are typically found for developed countries (for example see Van de Ven and van der Gaag, 1982; Holtmand and Olsen, 1978; Colle and Grossman, 1978; Goldman and Grossman, 1978;, Phelps, 1975, and Manning et. al., 1987).

In most developing countries, the price of medical care at government run facilities is small and in many cases zero. Hence, it is not surprising that prices do not ration the market. Acton (1975) and others have shown that when monetary prices are small, the price of time (ie. the opportunity cost of time used for obtaining the good) rations the market. One would expect, therefore, that time prices ration the market in developing countries. Indeed, in almost all of the studies on the demand for medical care in developing countries cited above, travel time is an important and significant

determinate of medical care demand. These results suggest that when monetary prices become larger, they will begin to ration demand as well.

How then can we explain the paradoxical results of zero price elasticities in developing countries? One explanation is that the models of medical care demand in developing countries are mis-specified. The studies typically model demand as a discrete choice with the price effect specified to be independent of income. This assumption is restrictive, since one would expect the wealthy to be less sensitive to price differences among providers than the poor. In fact it can be shown that these models are inconsistent with utility maximization (Gertler, Locay, and Sanderson, 1987). This point is demonstrated explicitly in the next section. Another possible cause for the paradoxical result is more straight forward. Many of the studies of medical data use sets of dubious quality. Especially information on income, prices and travel time leaves much to be desired. A final point is that the studies mentioned above specify time prices as non-monetary nuisance parameters in the utility function, implying that their coefficients reflect the marginal disutility of traveling. Becker (1965) points out that time prices should enter via the budget constraint. Dor, Gertler, and van der Gaag (1987) extend the Gertler et al. model by including time prices in the budget constraint to estimate travel time elasticities. Gertler and van der Gaag (1988) show that variation in travel time is sufficient to identify all of the parameters necessary to compute monetary price elasticities and compensating variations. We use the rest of this chapter to present this model in detail, and we will implement the model in the following chapter.

5.3 The Behavioral Model

Our framework is a model in which utility depends on health and on the consumption of goods other than medical care. If an illness is experienced, individuals decide whether or not to seek medical care. The benefit from consuming medical care is an expected improvement in health, and the cost of medical care is a reduction in the consumption of other goods and services.

Individuals have to decide not only whether to seek care, but also what type of care. They are able to choose from a finite set of alternative providers, one of which is self-treatment. Each provider offers an expected improvement in health (efficacy) for a price. Let us define the quality of an alternative provider as the expected improvement in health as a result of that provider's medical care. The price of an alternative includes both monetary outlays and private access costs such as the opportunity cost of travel time. Based on this information and their incomes, individuals choose the alternative that yields the highest utility.

Formally, let the expected utility conditional on receiving care from provider j be given by

$$U_j = U(H_j, C_j) \tag{1}$$

where H_j is expected health status after receiving treatment from provider j, and C_j is consumption net of the cost of obtaining care from provider j.

The medical care purchased from provider j is invested in health. The quality of provider j's medical care is defined as the expected

improvement in health over the health status that an individual would enjoy if he or she treated him or herself. In essence, quality is defined as an expected marginal product. Let H_o be expected health status without professional medical care (i.e. self-treatment). Then, the quality of provider j's care is $Q_j = H_i - H_o$, which yields an expected health care production function of the form

$$H_j = Q_j + H_0. \tag{2}$$

As specified in (2), quality varies by provider, and may in fact also vary by individual characteristics such as severity of illness, and the education, age and sex of the individual.

The health production function assumes a simple form for the self-care alternative. Since $H_j = H_0$, we have $Q_0 = 0$. This implicitly normalizes the health care production function so that the quality of a particular provider's care is measured relative to the efficacy of self-care.

Consumption expenditures (net of expenditures on medical care) are derived from the budget constraint. The total price of medical care includes both the direct payment to the provider and the indirect cost of access (e.g. the opportunity cost of travel time). Let P_j^* be the total price of provider j's care and Y be income, so that the budget constraint is

$$C_j + P_j^* = Y, \tag{3}$$

with $C_j > 0$ required for the jth alternative to be feasible. Substitution of (3) into (1) for C_j yields the conditional indirect utility function

$$U_j = U(H_j, Y - P_j^*).$$

Notice that income affects utility through the consumption term, and that the price of medical care is foregone consumption.

The time spent obtaining care could, in principle, come at the expense of work in the market place, production work at home or leisure. In that case income Y and net consumptic C_j should incorporate the value of the three activities. In an economy that is only partially monetized, such as the one in rural Côte d'Ivoire, non-traded home production is a major source of income. We capture this by including the value of home production consumed by the household into the measure of income. However, adding the value of leisure would greatly complicate the model and is left for future work. Hence, we implicitly assume that lost time comes at the expense of work or home production and not at the expense of leisure. The measurement of income is discussed in Chapter VI.

We are now ready to specify the utility maximization problem. Suppose the individual has J+1 feasible alternatives (with the j=0 alternative being self-care). The unconditional utility maximization problem is

$$U^* = \max(U_0, U_1, \ldots, U_J), \tag{4}$$

whe.e U^* is maximum utility. The solution to (4) gives the alternative that is chosen, and when there are these random terms in the model, the probability that each alternative is chosen. The probability an alternative is chosen can be interpreted as the demand function in a discrete choice model. These demand functions, then, can be used to solve for the <u>unconditional</u> indirect

utility functions and the expenditures or cost functions. The unconditional functions can be used to make welfare assessments of the impact of policy changes.

In summary, individuals who experience an accident or illness are faced with a choice of obtaining treatment from one of several available providers or caring for themselves. Each alternative provider offers an expected improvement in health (quality) for a price that reduces income available for the consumption of non-medical goods. The individual chooses the provider alternative whose quality-price combination offers the highest utility, where utility is derived from health and the consumption of all goods and services other than medical care.

5.4 Empirical Specification

The solution to (4) yields a system of demand functions, whose forms are probabilities that the alternatives are chosen. The probability that a particular alternative is chosen equals the probability that this choice yields the highest utility among all the alternatives. The functional form of the demand functions depends on the functional form of the conditional utility function and the distribution of the stochastic variables.

5.4.a The Conditional Utility Function

Gertler, Locay and Sanderson (1987) show that income can influence the choice of provider only if the conditional utility function allows for a non-constant marginal rate of substitution of health for consumption. This point is easily demonstrated in the context of a two alternative example.

Suppose that the individual has the choice between self-care and doctor care, and that the conditional utility function is linear, which imposes a constant marginal rate of substitution. Thus, the utility from doctor care (denoted by subscript d) is:

$$U_d = \alpha_0 H_d + \alpha_1 (Y - P_d),$$

and the utility from self-care (subscript s) is:

$$U_s = \alpha_0 H_s + \alpha_1 Y.$$

Then, the individual chooses doctor care if

$$U_d - U_s = \alpha_0 (H_d - H_0) - \alpha_1 P_d > 0. \tag{5}$$

If the doctor alternative is chosen the individual experiences an improvement in health of $(H_d - H_s)$ and a reduction in non-medical consumption of P_d. If the individual chooses doctor care, he or she gets an increase in utility of $\alpha_0(H_d - H_0)$ from improved health and a reduction in utility of $\alpha_1 P_d$ from reduced consumption. The decision rule in (5) says that the individual will choose doctor care if net change in utility is positive.

Equation (5) also shows that, if the marginal utility of health and the marginal utility of consumption are constant for all levels of income (i.e., if there is a constant marginal rate of substitution between health and income), then income does not contribute to which alternative is chosen. This is indicated by the fact the Y differences out of (5).

Some studies on health care provider choice try to include income in the model by specifying linear utility functions with alternative specific coefficients on income (Akin et al., 1984, 1986; Schwartz et al., 1988; Birdsall and Chuhan 1986; Dor and van der Gaag 1987; and Mwabu, 1986). This specification is inconsistent with stable utility maximiz ion. For instance, consider our earlier example with the exception that the coefficients on consumption vary by alternative:

$$U_d = \alpha_0 H_d + \alpha_{1d}(Y - P_d)$$

and

$$U_s = \alpha_0 H_0 + \alpha_{1s} Y.$$

Notice that the marginal utility of consumption is constant but varies by alternative. In this case, doctor care is chosen if

$$U_d - U_s = \alpha_0(H_d - H_s) - \alpha_{1d}P_d + (\alpha_{1d} - \alpha_{1s})Y > 0.$$

In this specification income does not difference out of the decision rule and therefore influences the choice. The identifying restriction, though, is that the coefficient on consumption must be different in the two alternatives. In other words, the marginal utility of consumption must be different for the two alternatives even when evaluated at the same level of consumption. This implies that two alternatives that provide the same health for the same price must yield different levels of utility to the same individual. If this is true, then preferences are not ordered and transitive, and therefore stable utility functions do not exist.

Alternatively, if the functional form does not impose a constant marginal rate of substitutional on the conditional utility function then income will influence the choice. To make this point we generalize the above example so that the decision rule in (5) is:

$$U_d - U_s = U(H_d, Y-P_d) - U(H_0, Y)$$

The income effect is found by the partial derivative

$$\frac{\partial(U_d - U_s)}{\partial Y} = \frac{\partial U(H_d, Y-P_d)}{\partial C} - \frac{\partial U(H_0, Y)}{\partial C} \qquad (6)$$

If the derivative of the conditional utility function with respect to consumption, $\partial U/\partial C$, is constant (i.e. $\partial^2 U/\partial C^2$ and $\partial^2 U/\partial C \partial H$ are zero), then (6) is zero and income does not influence the choice. When $\partial U/\partial C$ is non-constant, (6) is non-zero and income does influence the choice. Also the marginal rate of substitution, $-(\partial U/\partial H)/(\partial U/\partial C)$, is non-constant when $\partial U/\partial C$ is non-constant.

Another implication of the model is that if health is a normal good, the effect of price is smaller for larger incomes. This point requires the reasonable assumption that $\partial U^2/\partial C \partial H \geq 0$, (i.e., that the marginal utility of consumption increases with improved health). For health to be a normal good (6) must be positive. For (6) to be positive, $\partial^2 U/\partial C^2$ must be negative, i.e. the conditional utility function must be concave in consumption. Now we use this information to show that the effect of price diminishes with increases in income. The price effect from (8) is:

$$\frac{\partial(U_d - U_s)}{\partial P} = - \frac{\partial U(H_d, Y-P_d)}{\partial C}$$

Thus, an increase in income influences the price effect by

$$\frac{\partial^2(U_d - U_s)}{\partial P \partial Y} = - \frac{\partial U^2(H_d, Y-P_d)}{\partial C^2}.$$

Hence, an increase in income reduces the negative effect of price if $\partial^2 U/\partial C^2$ is negative. Therefore, if health is normal good (i.e. $\partial^2 U/\partial C^2 < 0$), the effect of price on the choice diminishes with income.

This point can be made in a more intuitive context. If health is a normal good, then the demand for health increases with income. A necessary condition for normality is that as income rises, the marginal rate of substitution of consumption for health diminishes, holding health constant. This point is demonstrated in Figure 1. where the continuous choice case wit health being a normal good is pictured. As income rises the point of utilit maximization moves out from the origin along the expansion path. Holding health constant at $\bar{H}$, we move to the right along the horizontal line as incor rises, intersecting the indifference curves at points of flatter slopes, implying a diminishing marginal rate of substitution.

In a discrete choice situation, normality implies that as income rises individuals are more likely to choose the 'higher price/higher quality' options. Here as well, a necessary condition for normality is that as income rises, the marginal rate of substitution of consumption for health diminishes holding health constant. This is demonstrated in Fig. 2, where the discrete choice case with health as a normal good is pictured. In Fig. 2, there is a choice between a 'high price/high quality' option (P_h, Q_h), and a 'low

price/low quality'' option (P_ℓ, Q_ℓ). At a low income level, say Y_ℓ, the choice is between points A and B, i.e., between a gain in health of ($H_h - H_\ell$) and a gain in consumption of ($P_h - P_\ell$). At income Y_ℓ, the additional consumption is preferred to the additional health and the 'low price/low quality' option B is chosen. The high income individual with income Y_h has a choice between points C and D. These points represent the same tradeoff between health and consumption as points A and B. As income rises the marginal rate of substitution of consumption for health falls along both horizontal lines H_h and H_ℓ. Eventually, at some income between Y_ℓ and Y_h, the gain in health is preferred to the gain in consumption. At income Y_h, the 'high price/high quality' option C is chosen.

In summary, if health is a normal good, then higher income individuals will choose the high quality/high price option and lower income individuals will choose the low quality/low price option, ceteris paribus. In other words, the price difference dissuaded low income individuals from choosing the high quality/high price option, but it did not dissuade high income individuals. What matters in the choice is the budget share of medical care. For low income individuals the high quality/high price option represents a significant portion of their budget. Rather than give up, say, food, they choose the low quality/low cost option. Alternatively, the high quality/high price option is a small portion of high income individuals budgets implying that they don't have to give up much to choose it. Finally, to allow health to be a normal good and therefore allow income to influence the choice, the functional form of the conditional utility function should not impose constant marginal rate of substitution. Whether or not health is a

Figure 1: The Trade-Off between Health and Consumption

The Continuous Choice Case

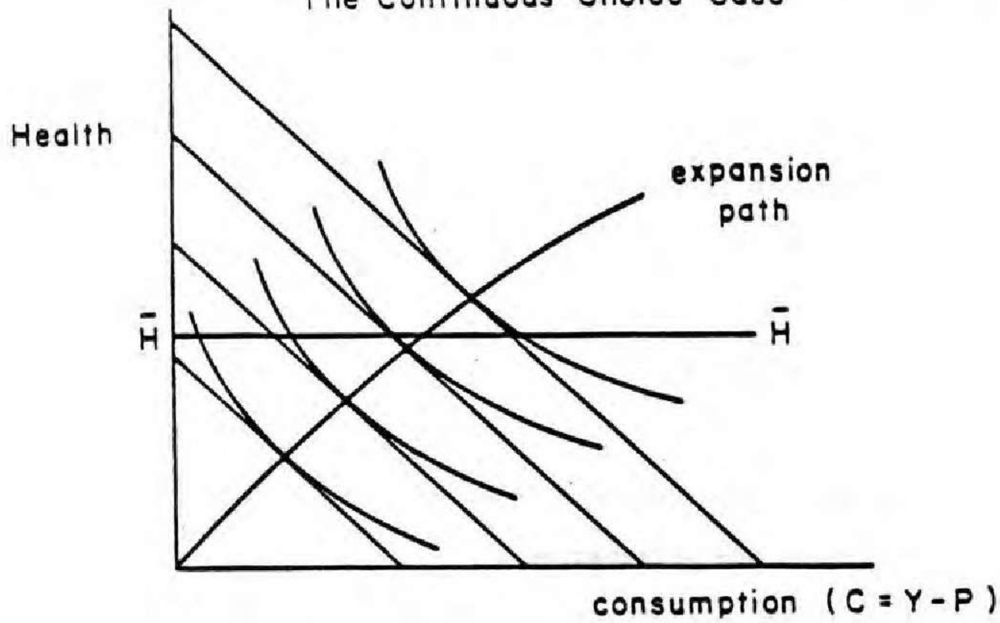
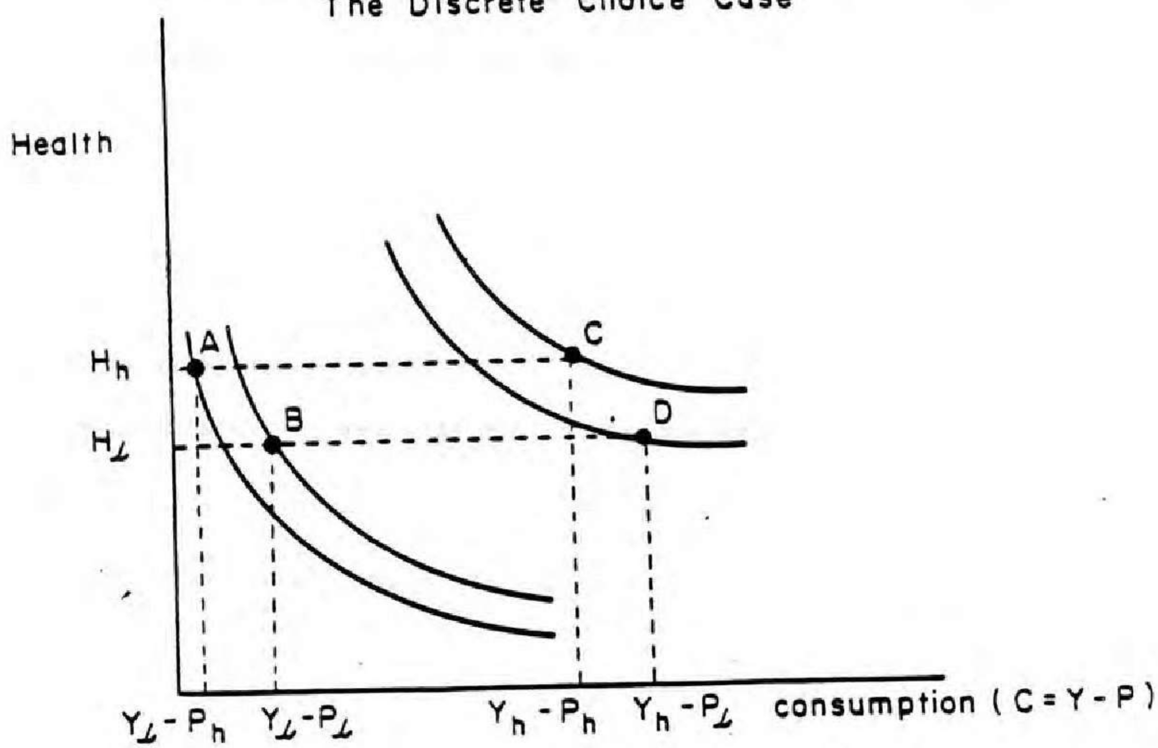


Figure 2: The Trade-Off between Health and Consumption

The Discrete Choice Case



normal good is an empirical question, and the functional form should be flexible enough for the data to answer this question.

A parsimonious functional form for the conditional utility function that does not impose a constant marginal rate of substitution and is consistent with stable utility maximization, is the semi-quadratic, which is linear in health and quadratic in consumption. Specifically, let the conditional utility function be

$$U_j = \alpha_0 H_j + \alpha_1 C_j + \alpha_2 C_j^2 + \varepsilon_j \tag{8}$$

where ε_j is a zero mean random taste disturbance with finite variance and is uncorrelated across individuals and alternatives.

Consumption (i.e. income net of the cost of obtaining care from provider j) is derived from the budget constraint in (3). Specifically, $C_j = Y - P_j^*$. The full price of medical care is the direct payment to the provider plus the value of time spent in obtaining the care. Consumption, then, is

$$C_j = Y - (P_j + wT_j) \tag{9}$$

where P_j is the direct payment to provider j, w is the opportunity cost of time, and T_j is the time spent obtaining care from provider j. Substitution of (9) into (8) yields

$$U_j = \alpha_0 H_j + \alpha_1 \big(Y - (P_j + wT_j)\big) + \alpha_2 \big(Y - (P_j + wT_j)\big)^2 + \varepsilon_j \tag{10}$$

Since $P_0 = H_0 = 0$, the conditional utility function for the self-care alternative

$$U_0 = \alpha_0 H_0 + \alpha_1 Y + \alpha_2 Y^2 + \varepsilon_0. \tag{11}$$

The identification of the parameters in (10) and (11) requires that the values of expected health and consumption differ across the alternatives. The alternative chosen is the one that yields the highest utility. Therefore, if the contribution of either expected health or consumption to utility is constant across alternatives they cannot influence which alternative is chosen. Attributes that are constant across alternatives are differenced out of the decision rule. This implies that it is variation in prices across alternatives that identifies α_1 and α_2. If prices did not vary across alternatives, then consumption would be constant across alternatives and difference out of the decision rule.

At this point it is easy to show that all of the parameters can still be identified if monetary prices are zero. The identification of α_1 and α_2 in (10) and (11) require variation in prices and/or travel time across alternatives so that the contribution of consumption varies across alternatives. Hence, variation in T_j across alternatives suffices to identify these parameters.

5.4.b Quality

The remaining issue in the specification of the conditional utility function is the measurement of the expected efficacy (quality) of each

alternative. Substitution of the health production function (2) into the conditional utility function (10) yields

$$U_j = \alpha_0 H_j + \alpha_0 Q_j + \alpha_1(Y - P_j - wT_j) + \alpha_2(Y - P_j + wT_j)^2 + \varepsilon_j. \qquad (12)$$

Since $Q_0 = 0$, the conditional utility function in (13) for the self-care alternative reduces to

$$U_0 = \alpha_0 H_0 + \alpha_1 Y + \alpha_2 Y^2 + \varepsilon_0. \qquad (13)$$

The $\alpha_0 H_0$ term appears in all the conditional utility functions, and its value is constant across alternatives. Since only differences in utility matter, these terms can be ignored.

Estimation is complicated by the problem that quality is unobserved, in the nonself-care conditional utility functions in (12). We solve this problem by letting Q_j be a parametric function of its observable determinants. The expected quality of provider j's care is the expected improvement in health (marginal product) over the expected level of health that would occur from self-treatment. The expected improvement in health can be viewed as being produced through a household production function. The arguments of the household production function are provider characteristics, and individual characteristics such as severity of illness and ability to implement the recommended treatment plan. For example, the expected improvement in health from hospital care relative to self-care may be increasing in education, since individuals with higher education may be better able to implement recommended treatment plans.

Moreover, the marginal utility of an individual's health may also vary with household characteristics. For example, the marginal utility of the health of a child may depend on how many children there are in the household. In general, the value of health may vary with many demographic variables such as age, sex, education, and family composition.

The basic determinants of both the quality household production function and the marginal utility of quality are demographic variables. Pollak and Wachter (1975) argue that the separate effects of demographic variables in the household production function and in the marginal utility of quality cannot be identified separately. Therefore, we specify a reduced form model that shows how utility is derived from quality. Formally, let this function be given by

$$\alpha_0 Q_j = \beta_{0j} + \beta_{1j} X + \eta_j, \tag{14}$$

where X is a vector of the determinants of quality and utility from quality, and η_j is a zero mean random disturbance with finite variance.

To make the specification as general as possible, we let the coefficients in (14) vary by alternative. Allowing for different intercepts permits the baseline quality to vary by alternative, and having different slope coefficients allows the provider's productivity relative to self-care to vary with individual characteristics such as age, education, and severity of illness. The random disturbance term captures unmeasured portions of the quality function. These disturbances may be correlated across alternatives.

Since $Q_0 = 0$, the utility from quality function simplifies to $\alpha_0 Q_0 = 0$ for the self-care alternative. Hence, the coefficients in (14) are interpreted relative to the self-care alternative. Notice further that the normalization sets the unobserved portion of quality in the self-care alternative, η_0, equal to zero as well.

Substitution of (14) into the conditional utility functions in (12) and ignoring the $\alpha_0 H_0$ term that appears in all the conditional utility functions, gives us

$$U_j = V_j + \eta_j + \varepsilon_j, \tag{15}$$

where

$$V_j = \beta_{0j} + \beta_{1j}X + \alpha_1(Y - P_j - wT_j) + \alpha_2(Y - P_j + wT_j)^2 \tag{16}$$

This completes the specification of the indirect conditional utility functions. Notice that the intercept and coefficients on the demographic variables vary by alternative, whereas the coefficients on the economic variables are constant across alternatives. Further, the disturbances in the nonself-care conditional utility functions are correlated with each other but, since $Q_0 = 0$, they are uncorrelated with the disturbance in the self-care conditional utility function.

5.4.c <u>The Demand Functions and Welfare</u>

The demand function for a provider is the probability that the utility from that alternative is higher than the utility from any of the other alternative. Most of the previous studies on the demand for medical care in

developing countries have assumed that these demand functions take on a multinominal logit (MNL) form. As discussed in McFadden (1981), the MNL suffers from the Independence of Irrelevant Alternatives assumption. This assumption is equivalent to assuming that stochastic portions of the conditional utility functions are uncorrelated across alternatives, and imposes the restriction that the cross-price elasticities are the same across all alternatives. A computationally feasible generalization of the MNL is the Nested Multinominal Logit (NMNL), which was introduced in McFadden (1981). The NMNL allows for correlation across sub-groups of alternatives and, therefore, non-constant cross-price elasticities. The NMNL allows the grouping of more similar alternatives (i.e. closer substitutes) so that the cross-price elasticities are more elastic within groups than across groups. The NMNL also provides a specification test for groupings. Further, the NMNL is a generalization of the MNL as the MNL is "nested" within it. This provides us with a specification test.

The NMNL specification for our problem is as follows. Following McFadden (1981), we assume that the joint distribution of the η_i's and Σ_i is a type B extreme value distribution. Let choice 0 be the self-care alternative, and choice 1,..., J be the various provider alternatives. The η_j's imply that the error terms of the provider alternatives may be correlated with each other, but not with the self-care alternative. Therefore, the self-care demand function (i.e. the probability of choosing self-care) is

$$\Pi_0 = \frac{\exp(V_0)}{\exp\,(V_0) + \left[\sum_{j=1}^{J} \exp\,(V_j/\sigma)\right]\sigma}$$

and the demand for provider i is:

$$\Pi_i = (1 - \Pi_0)\left[\frac{\exp(V_i/\sigma)}{\sum_{j=1}^{J} \exp(V_j/\sigma)}\right]$$

where σ is one minus the correlation between the error terms of the providers conditional, utility functions introduced by the η_j's.

The log likelihood function for this problem is simply

$$\ln L_i = \sum_{j=0}^{J} D_{ij} \ln \Pi_{ij}$$

where D_{ij} is a dichotomous variable that takes on the value one if individual i chose alternative j. Although a two step estimate exists (McFadden, 1981), we will employ full information maximum likelihood to estimate the model. Hensher (1986) shows that full information maximum likelihood estimation of NMNL yields substantial efficiency gains over the more popular two-step procedure.

McFadden (1981) shows that σ must be between zero and one for the model to be consistent with utility maximization. When σ is close to zero, the error terms in the provider alternatives' conditional utility functions are highly correlated. This implies that individual views providers as closer substitutes with each other than any with self-care. In terms of cross-price elasticities, this implies that a provider's demand is more sensitive to another provider's change in price than is self-care demand. Thus, if σ is

less than one, an increase in one provider's price will cause a greater percentage increase in other providers' demands than in self-care.

Finally, as mentioned above, the MNL is a special case of the NMNL. Specifically, when $\sigma = 1$, the NMNL reduces to an MNL. In this case the error terms are uncorrelated and the self-care alternative and the providers are viewed as equally close substitutes for one another. Moreover, the cross-price elasticities are constant across alternatives. This condition provides a formal specification test of the MNL.

The estimated demand functions can be used to project the impact of user fees on demand and revenues, and on the number of people who do not seek health care as a result of user fees. These demand functions also form the basis of our measurement of the willingness to pay for reduced travel time to a medical care facility. The willingness-to-pay measure is calculated as a compensating variation, which is the amount of income that an individual must be compensated to make him or her just as well off after a price change as before the change. The effect of a price change on welfare involves both an income effect (reduction in Y-P) and a substitution effect (changes in the probabilities that the alternatives are chosen). Both must be taken into account in the compensating variation calculation. The calculation involves solving the demand functions to obtain the unconditional indirect utility and expenditure functions with which compensating variation experiments can be conducted. Small and Rosen (1981) provide the general theory for discrete choice demand systems. Consider changing the vector of provider travel times from T to T'. In the case of a nested multinominal logit, the compensating variation, CV, i.e., the amount of income that an individual must be given or is willing to forego to make him as well off at T' as he or she was at T is

$$CV = (1/\lambda)\{\ln[\exp(V_0) + [\sum_{j=1}^{J} \exp(V_j/\sigma)]^{\sigma}]$$

$$- \ln[\exp(V_0') + [\sum_{j=1}^{J} \exp(V_j'/\sigma)]^{\sigma}]\} \qquad (17)$$

where V_j and V_j' are evaluated at T and T', respectively, and where λ is the marginal utility of income.

In order for (17) to be exact, the marginal utility of income λ must be independent of alternative specific characteristics and price (McFadden, 1981; Small and Rosen 1981) Although λ is independent of quality, it is not independent of price. Specifically

$$\lambda = \partial U/\partial Y = \alpha_1 + 2\alpha_2(Y - P).$$

Since the prices are very small relative to income, λ is likely to be approximately constant across small differences in price. Hence, each individual's average marginal utility of income over the alternatives is a good approximation of λ. Although this is little variation in λ for an individual across alternatives, λ may vary greatly across individuals as there is substantial variation in income.

5.5. Summary

In this chapter we first drew attention to an apparent parodox in the health economic literature: price elasticities in developing countries are

reported to be lower than in the developed world. We presented various reasons why the opposite could be expected. We also discussed some of the theoretical and empirical shortcomings in the literature on the demand for health-care in developing countries.

Based on this discussion, we derived a fairly general and flexible model of the demand for medical care that has the following attractive properties:

1. It is consistent with utility maximization which allows us to use the derived demand functions for welfare analysis.

2. It is flexible. In particular, the effect of price on the demand for medical care is allowed to differ by income level.

3. It is empirically tractable.

These properties allow us the answer the main empirical question of this study: how price elastic is the demand for medical care. We will do so in the next chapter.

CHAPTER 6

Estimation and Results

6.1 Introduction

In this chapter we describe the estimation of the model of medical care provider choice developed in the previous chapter. The main purpose of the estimation is to obtain price elasticities of demand so as to be able to investigate the cost recovery, utilization, and welfare implications of various user fee policies. The estimation results for both countries and for all age groups show that prices are important determinants of medical care utilization. Moreover, as expected, we find that the price elasticity of demand falls with income. Demand is in the elastic range for the lowest income groups, while it is inelastic in the upper income groups. These results imply that user fees can generate substantial revenue without much affect on the utilization by individuals in the upper income groups, but may cause large reductions in utilization by individuals in the lower income groups.

The policy and overall welfare implications of these results will be explored in detail in the next chapter. In this chapter we describe the data and the estimation results. The chapter is subdivided into sections on Côte d'Ivoire and Peru, respectively. We begin by discussing the relevant provider choices available within the institutional structure of each country, and the measurement of the variables that are used in the estimation. Subsequently, we present the estimated coefficients and price elasticities.

The models are estimated with data from the 1985 Côte d'Ivoire Living Standards Survey (CLSS) and the 1985 Peruvian Living Standards Survey

(PLSS). These identical multipurpose household surveys were aimed at measuring socio-economic factors relevant to the standard of living of the respective populations. The surveys collected detailed information on individuals' illnesses and medical care utilization over the four weeks immediately prior to the interview, in addition to many socio-economic variables relevant to medical care demand such as income, family structure, and education. A useful feature of the Living Standards Surveys is that they also collected community level information in rural areas. For each village, information on travel time to the nearest available medical facility of every type, and village level male and female agriculture wage rates were collected.

To ensure flexibility in the empirical specification, separate models are estimated for children and adults in both countries. All of the models are estimated by full information maximum likelihood.

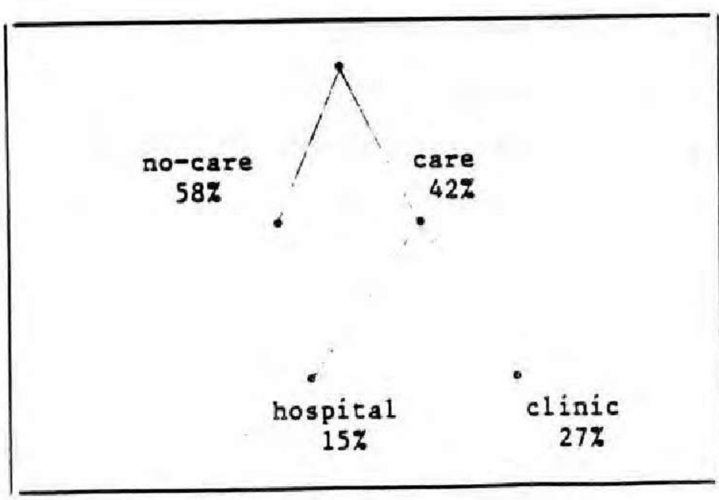
In the appendix to this chapter, we report the estimation results of the misspecified model used in earlier work (Akin et al., 1984, 1986; Birdsall and Chuhan, 1986; Dor and van der Gaag, 1987; Mwabu, 1986; and Schwartz et al., 1988). These results also indicate that prices are statistically significant determinants of medical provider choice. Since, as pointed out in the previous chapter, these models are inconsistent with utility mazimization, the results cannot be interpreted structurally. Therefore, the estimates are not representative of demand function parameters, but rather of reduced form correlations.

6.2 Côte d'Ivoire

6.2.a Institutions and Measurement of Variables

In rural Côte d'Ivoire, almost no private health care is available and few people report using it. The vast majority of individuals who experience an illness or accident seek care from either a government hospital or clinic, or do not obtain any professional medical treatment at all. Traditional healers do exist, but less than 3% of the report obtaining traditional care. Therefore, we leave them out of the analysis. Finally, only a handful of people in rural areas travel the very long distance to an urban area to go to a private doctor or to a pharmacy. Given this information, the relevant medical care alternatives for residents of rural Côte d'Ivoire appear to be government hospitals, government clinics, and self-care. The distribution of health-care provides choices in our sample as given in Figure 1. Of the 42% of individuals who seek professional medical care for an illness, about 2/3 go to clinics and 1/3 to hospital outpatient centers.

FIGURE 1.: **Health-care Provider Choice**
Rural Côte d'Ivoire, Total Population



It is this split of the sample (those who do not seek care, those who go to a hospital clinic and those who visit a clinic) that we try to explain with our theoretical model. For ease of reference, we repeat this model here. Let Π_j be the probability that an individual chooses alternative j, with j=0 being the self-care alternative. Then

$$\Pi_0 = \frac{\exp(V_0)}{\exp(V_0) + [\sum_{j=1}^{J} \exp(V_j/\sigma)]^{\sigma}}$$

and $$\Pi_i = (1-\pi_0) [\frac{\exp(V_i/\sigma)}{\sum_{j=1}^{J} \exp(V_j/\sigma)^{\sigma}}]$$

where σ is one minus the correlation between the error terms of the provider alternatives (self-care excluded). Thus the model is specified as a Nested Multi-Nomial Logit model that collapses into a Multi-Nomial Logit model if we find that $\sigma = 1.00$. The term V_j represents the utility derived from alternative j, and is parameterized as

$$V_j = \beta_{0j} + \beta_{1j}X + \alpha_1(Y - P_j - wT_j) + \alpha_2(Y - P_j - wT_j)^2$$

where X is a vector of socio-economic variables

Y is total income

P_j is the fee for provider j

w is the opportunity cost of time, and

T_j is the travel time to provider j.

The term $(Y - P_j - wT_j)$, which enters both in linear and quadratic form, shows the effects of income and prices (both monetary and non-monetary) on the demand for medical care. The vector X includes variables such as age, sex, and education, that may influence the efficacy of obtaining care from a specific provider as well as the value (utility) the individual (or household) puts on an increase in health status.

As specified in the theoretical model, an alternative that yields the highest utility is chosen, where utility depends on the expected quality (improvement in health) and on consumption net of medical care. The expected quality and consumption net of medical care must be specified for each option.

Consumption net of medical care is income less the cost of obtaining medical care. Income is calculated as the average monthly value of total household consumption. Household consumption is a better measure of permanent income than reported income because it is less sensitive to temporary fluctuations (e.g. seasonality of work) and because it includes the value of home production. In developing countries such as Côte d'Ivoire and Peru, non-market activities such as home production are major sources of income. In Côte d'Ivoire the value of home-grown produce consumed by the household amounts to approximately half the food budget and one third of total consumption. Purchasing medical care not only reduces the monetary resources available for other consumption, but also reduces time available for home production and other work.

Since the government facilities had no user fees in 1985, the price of care was the opportunity cost of time spent in obtaining care. Recall from the theory chapter that variation in travel time is sufficient to identify all the parameters of the demand functions, thus allowing calculation of price

elasticities and willingness-to-pay measures. The opportunity cost of time is calculated as the product of the round-trip travel time and the individual's wage rate. For children, the opportunity cost of the mother's time is used. The round trip travel time for each individual to each alternative comes from the community survey, and the appropriate village male or female agricultural wage rate is taken as the unit opportunity cost of time.

The male and female village agricultural wage rates are reasonable estimates of the opportunity cost of time. Newman (1987) shows that 93% of all working adults in rural areas of Côte d'Ivoire are engaged in agricultural activities. Moreover individual variation in wage rates within village is likely to be small since over 90% of the adults have less than one year of schooling.

The utility derived from an expected increase in health status is specified to be a function of the option chosen and individual characteristics. The arguments of the alternative specific functions are individual and family characteristics that may affect quality and the marginal utility of quality. Variables that may influence the efficacy of medical care include age, the number of healthy days last month, education, the number of other adults in the household, and the number of children in the household. Age and the number of healthy days proxy for health status. Age is entered in spline form with the break occurring at 40 years old for adults and at 3 for children. The break points were determined by grid searches, which involve finding the break points that maximize the likelihood function. Education (years of schooling) is included since more educated individuals may be better able to implement recommended treatments and therefore produce more health relative to self-care than can less educated individuals. In the case of

children the mother's education is used. The family composition variables are included because the more adults and fewer children there are in the household, the better able a household may be at self-treating an illness. Variables that may affect the marginal utility of quality include age, sex and household composition.

Since the vast majority of individuals living in rural Côte d'Ivoire are farmers (97%), the sample used for estimation excluded non-farm households. The sample also excluded households in villages for which the community informatic[illegible]as not available. In order to focus on primary medical care, visits for ob[illegible]ric and other preventive purposes were excluded. There were 19 such cases. [illegible]e exclusion of villages without community level data reduced the sample by 8%. The final sample included 49 villages, with observations of 1030 adults and 769 children under age 16 who experienced an accident or illness in the four weeks prior to the survey.

Descriptive statistics are presented in Table 1. We see that 24% of the adults and 30% of the children who report an illness or injury visit a clinic, while 15% of adults and 14% of children obtain outpatient hospital care. It is noteworthy that the average travel time is about an hour to clinics and about an hour and three quarters to a hospital.

TABLE 1. Descriptive Statistics - Côte d'Ivoire

	Adults		Children	
Variables	Mean	Standard Deviation	Mean	Standard Deviation
Clinic a/	0.24	(0.49)	0.30	(0.55)
Hospital a/	0.15	(0.38)	0.14	(0.37)
Clinic Travel Time b/	1.18	(1.32)	0.92	(1.16)
Hospital Travel Time b/	1.90	(.92)	1.56	(1.60)
Monthly Family Income c/	97.85	(81.19)	108.41	(99.66)
Hourly Wage d/	75.48	(28.54)	74.89	(26.42)
Age	44.85	(17.12)	6.33	(3.64)
Male	0.46	(0.50)	0.51	(0.50)
Education	0.85	(2.16)	0.91	(2.88)
Healthy Days	18.60	(9.94)	22.34	(7.24)
Number of Adults	4.57	(2.96)	4.62	(3.01)
Number of Children	4.86	(2.44)	4.97	(2.77)
Sample Size	1030		769	

a/ Binary variables; equals one if alternative is chosen and zero otherwise.

b/ Round trip travel time; reported in hours.

c/ Calculated as total household consumption and reported in thousands of 1985 Ivorian CFA's. In 1985, the exchange rate was approximately 461 CFA per U.S. dollar.

d/ Reported in 1985 Ivorian CFA's.

6.2.b <u>Estimation Results</u>

The nested-multi-nomial logit (NMNL) models of provider choice in rural Côte d'Ivoire were estimated by full information maximum likelihood. One model was estimated for the adults and another for children. The results are presented in Table 2, and are generally consistent with economic theory.

The estimated value of σ is .34 for adults and .41 for children. The estimates are both significantly different from zero and significantly different from one. Therefore, the models are both consistent with utility maximization and reject the MNL specification in favor of the NMNL. The result that σ is less than one also implies that hospital and clinic care are closer substitutes than hospital and self-care or clinic and self-care.

In both the adults' and children's models the coefficients on the consumption and/or its square are significantly different from zero. The signs of the coefficients indicate that the conditional utility function is concave in consumption. In other words, the marginal utility of consumption is diminishing, but does not become negative in the relevant range. Prices enter the model via the consumption terms. As shown in Chapter V, if the prices did not vary across alternatives, the coefficients on consumption would not be identified as the value of consumption would then be constant across alternatives. The fact that these coefficients are significant implies that the relative prices of the alternatives are relevant to the choice of the provider. Prices and income enter the model in a highly non-linear fashion through the consumption terms, making it hard to judge the order of magnitude of their effects. Therefore, we will examine them in detail in the next

section. This section is devoted to discussing the effects of the other variables. We begin with the adults and then consider children.

Unlike in developed countries, adults in rural Côte d'Ivoire seem to reduce medical care utilization over the life cycle, ceteris paribus. The coefficients on the first age spline indicates that individuals between the ages of 16 and 40 are equally likely to seek medical care for the treatment of an accident or illness. After age forty, though, the demand for both hospital care and clinic care falls with age.

TABLE 2: **The Multi-Nomial Logit Model of Provider Choice Estimates - for Côte d'Ivoire**

Variable	Adults Coefficient	Adults t-Statistic	Children Coefficient	Children t-Statistic
Consumption*	10.04	(5.44)	14.43	(5.65)
Consumption** squared	-0.02	(3.30)	-0.01	(2.14)
Sigma	0.34	(3.54)	0.41	(4.37)
Hospital				
Constant	1.64	(1.20)	2.68	(2.54)
Age 1	-0.00	(0.11)	-0.69	(2.31)
Age 2	-0.10	(2.82)	-0.04	(0.64)
Education	-0.05	(0.45)	-0.05	(0.13)
Male	0.73	(1.68)	0.05	(0.13)
Children	0.17	(2.17)	0.21	(2.44)
Adults	-0.15	(1.69)	-0.19	(2.06)
Healthy Days	-0.13	(3.32)	-0.09	(2.71)
Clinic				
Constant	0.69	(0.51)	2.50	(2.51)
Age 1	0.02	(0.66)	-0.64	(2.40)
Age 2	-0.10	(2.60)	0.04	(0.76)
Education	-0.03	(0.31)	0.00	(0.50)
Male	-0.07	(0.16)	0.17	(0.46)
Children	0.15	(1.89)	0.18	(2.28)
Adults	-0.15	(1.78)	-0.21	(2.30)
Healthy Days	-0.10	(2.45)	-0.06	(2.05)
Sample Size	1030		769	
Log Likelihood	-886		-679	

One explanation for this unusual pattern of medical care utilization over the life cycle may be derived from human capital theory. Families may prefer to invest scarce resources in the health of members for whom the return is higher. For the same improvement in health, the economic return, in terms of family income, is higher from investing in the health of younger more productive members than from investing in the elderly. A second reason may be that the available medical care in rural Côte d'Ivoire is best suited for helping the acute health problems common to prime age adults rather than the more complex chronic problems of the aged. Hence the available medical care is less productive (efficacious) in treating the elderly than in treating prime age adults, resulting in lower utilization rates of the latter.

Again unlike in developed countries, education does not seem to effect provider choice or the decision to seek formal care. The negligible education effect is most likely to result from the small variation in education in the Ivorian sample. The average years of schooling is less than one year. Therefore, the estimated coefficient is probably not a true measure of the influence of education on medical care utilization.

We find that males who experience an accident or illness are more likely to seek care, and in particular hospital care, than are females. This is again consistent with the theory of investing in the more productive household members, or at least in household members that are considered to be more productive. It could also be a sign of gender bias that warrants more scrutiny than can be given within the scope of this study. Finally, the types

of illnesses males experience may be better treated within the current Ivorian health-care infrastructure than the types of illnesses females experience.

The coefficients on the family structure variables indicate the individuals in the households with fewer adults and more children are more likely to seek both hospital and clinic care. This is consistent with the hypothesis that having more adults in the household allows more time to better care for sick individuals at home, and having more children results in having less time to take of the ill.

Finally, and not surprisingly, severity of illness, as indicated by the number of healthy days, substantially reduces the probability of an adult seeking medical care, but it does not affect which alternative is chosen. This finding is common to almost all studies of medical care utilization in both the developed and developing world. One caveat is that the number of days an individual was healthy may be endogenous in a model of medical care demand. To ensure the robustness of our price and income effects, we reestimated the model on both adult and children samples without including the healthy days variable. There was no difference in the estimated coefficients on the other variables.

The results from the model for children are similar to those for adults. The pattern of medical care utilization through childhood is described by the coefficients on the age splines. They show that demand falls with age from zero to three years old and is flat thereafter. In other words, that infants who experience an accident or illness are more likely to seek medical care than older children, and more likely to seek the higher quality hospital care over clinic care.

As in the adult model, mother's education does not influence provider choice, and again we attribute this to the lack of variation in the data rather than interpret it as a true education effect. Unlike the adult model, though, there are no differences by sex. Again as in the adult model, severity of illness increases the demand for medical care, the number of adults in the household has a negative effect on the probability of going to both clinics and hospitals, while the number of children has positive effects.

6.2.c Price Elasticities

Since prices and income enter the demand functions in a highly non-linear fashions, it is hard to assess the direction and magnitude of their effects on demand directly from the estimation results in Table 2. To facilitate this, we estimate arc price elasticities of the demand for clinic and hospital care by income quartiles. The arc elasticities are obtained by sample enumeration (Train, 1986) within each income quartile. More specifically, the probability of an individual choosing an alternative at the bottom and top of the price range we consider, is predicted for every individual in the income group. Only the price of the alternative being considered is changed for these calculations. In order to hold constant all characteristics except for price and income, each individual was assigned other characteristics equal to the sample mean. Thus, within an income group, only the price varies, and within a price range, only income varies. The arc price elasticity is then constructed by dividing the average percentage change in the sum of the probabilities, by the average percentage change in the

price. Thus an arc price elasticity of, say, -.50 implies that a 10% increase in price will result in a 5% reduction in demand.

Arc price elasticities of the demand for clinic care and the demand for hospital care were calculated for three ranges of CFA 50 each, ranging from free care to a fee of CFA 150. These are within-sample calculations as the opportunity cost of time averages about 100. The arc price elasticities for adults are presented in Table 3 and for children in Table 4. Reading down a column of Table 3 or 4 shows the change in the price elasticity moving down the demand curve, holding income constant. Reading across a row of Table 3 or 4 reflects the change in the price elasticity as income rises, holding price constant.

The results show that the price elasticity of demand falls with income. Indeed, adults' and childrens' demand for both clinic and hospital care is vastly more elastic at lower income levels than at the top of the income distribution. Clinic and hospital demand of both adults and children in the bottom three-quarters of the income distribution is in the price elastic region, whereas demand from those in the top income quartile is well into the inelastic region. In addition, childrens' demand for both clinic and hospital care is more price elastic than is adults' demand. The difference is smaller in the lower income groups, but is substantial in the highest income group. These results indicate that user fees will be regressive in the sense that they reduce medical care utilization by the poor substantially more than by the rich. Furthermore, user fees will reduce the utilization of medical care by children more than they will reduce utilization by adults. On the other hand, user fees can generate substantial revenues without adverse utilization effects in relatively better-off communities. We will come back to these implications in Chapter VII.

TABLE 3: ARC Price Elasticities by Income Quartile
Côte d'Ivoire; Adults

Range of Fees*	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)
Clinic				
0-50	-0.61	-0.58	-0.53	-0.38
50-100	-1.16	-0.40	-0.19	-0.05
100-150	-1.83	-1.71	-1.57	-0.93
Hospital				
0-50	-0.47	-0.44	-0.41	-0.29
50-100	-0.86	-0.81	-0.76	-0.51
100-150	-1.34	-1.27	-1.18	-0.71
Mean Income **	33.28	64.44	99.52	222.87

* Measured in Ivorian CFA.
** Measured in thousands of Ivorian CFA per month.

TABLE 4: ARC Price Elasticities by Income Quartile
Côte d'Ivoire; Children

Range of Fees*	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)
Clinic				
0-50	-0.90	-0.80	-0.67	-0.31
50-100	-1.81	-1.56	-1.29	-0.51
100-150	-2.82	-2.43	-1.98	-0.66
Hospital				
0-50	-0.65	-0.58	-0.49	-0.12
50-100	-1.34	-1.17	-0.98	-0.20
100-150	-2.32	-1.98	-1.60	-0.48
Mean Income **	33.28	64.44	99.52	222.87

* Measured in Ivorian CFA.
** Measured in thousands of Ivorian CFA per month.

Implicit in the calculations of these price elasticities are the effects of travel time on utilization, working through the opportunity cost of time. To explicitly investigate the rationing effects of facility location, we calculate travel time elasticities. In order to estimate how travel time affects demand across income groups we need to allow wage rates (the opportunity cost of time) as well as income to vary across the income quartiles. We use the agricultural wage rate associated with each income quartile for these calculations.

Arc travel time elasticities of the demand for clinic care and the demand for hospital care were calculated for four ranges of one hour each, covering 0 to 4 hours. They are presented in Table 5 for adults and in Table 6 for children. Reading down a column of Table 5 or 6 reflects the change in the time elasticity for increasing travel time, holding income constant. Reading across a row of Table 5 or 6 reflects the change in the time elasticity as income rises, holding time constant.

The magnitude of the travel time elasticity estimates are very similar to the price elasticity estimates. This is not surprising since the opportunity cost of time is currently the whole price of medical care in Côte d'Ivoire, thus time prices ration the market. The elasticity estimates show individuals in the bottom 3/4 of the income distribution to be much more sensitive to the opportunity cost of time than richer individuals in the top quarter. Moreover, children's medical care utilization is more sensitive to time than adults' utilization in the higher income groups, but not for the lower income groups. One interesting result is that demand becomes slightly more time elastic as income rises over the bottom three income quartiles.

This reflects the increase in wage rates (i.e. the opportunity cost of time) over these income groups.

These results imply that the opportunity cost of time is a bigger access barrier for poorer individuals than it is for richer individuals. Poorer individuals can less afford to loose productive time than can the rich. The lower income groups in our sample consist of subsistence farmers who obtain a good portion of their income in the form of self-produced food. Moreover, little income is available to purchase processed goods which in turn implies that many hours must be spent in home production activities such as gathering wood and fetching water. Our results clearly underscore that poor people are not just money-poor, they are also time-poor. Therefore, increasing the supply of health-care facilities in poor areas is a sine qua non for improving access. In other words, if improving the poor's access to medical care is a major goal of social policy, providing the care "free of charge", is simply not enough.

TABLE 5: **ARC Travel Time Elasticities by Income Quartile - Côte d'Ivoire Adult**

Range of Time*	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)
Clinic				
0-1	-0.35	-0.32	-0.28	-0.14
1-2	-0.61	-0.57	-0.50	-0.24
2-3	-0.85	-0.83	-0.72	-0.33
3-4	-1.10	-1.09	-0.95	-0.42
Clinic				
0-1	-0.25	-0.23	-0.21	-0.11
1-2	-0.44	-0.42	-0.37	-0.19
2-3	-0.65	-0.62	-0.55	-0.27
3-4	-0.85	-0.84	-0.74	-0.34
Mean Income **	33.29	64.44	99.52	222.87

* Time is reported in hours.
** Measured in thousands of Ivorian CFA

TABLE 6: **ARC Travel Time Elasticities by Income Quartile - Côte d'Ivoire Adults**

Range of Time* Change	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)
Clinic				
0-1	-0.53	-0.54	-0.54	-0.40
1-2	-0.93	-0.96	-0.98	-0.68
2-3	-1.33	-1.39	-1.43	-0.92
3-4	-1.72	-1.80	-1.88	-1.10
Hospital				
0-1	-0.41	-0.42	-0.42	-0.31
1-2	-0.71	-0.73	-0.75	-0.57
2-3	-1.03	-1.07	-1.12	-0.75
3-4	-1.37	-1.44	-1.52	-0.95
Mean Income **	33.29	64.44	99.52	222.87

* Time is reported in hours.
** Measured in thousands of Ivorian CFA

6.3 <u>Peru</u>

6.3.a <u>Institutional Environment and Measurement of Variables</u>

Since the data for the Peru models come form a survey instrument that is virtually identical to the one used for the Côte d'Ivoire survey, the empirical specification and the variables are constructed in almost the same way. Some differences are necessary as the institutional environment is different. Specifically, unlike Côte d'Ivoire, there is a large private health-care sector which charges fees for utilization of their services. In this section we highlight the differences between Peru and Côte d'Ivoire, relevant for estimating the Peruvian provider choice model.

Rural Peru has a mix of public and private medical care. The major provider of public medical care is the Ministry of Health, which operates hospitals and clinics. These institutions are administrated at the health department (region) level, where the user fee is set. In 1985/1986, user fees were very low. We used the department's median clinic and hospital fee paid by individuals in our sample as monetary prices. There are 14 departments in our sample. The total prices of clinic and hospital care are the sum of the department level monetary prices and the opportunity costs of time, where the opportunity cost of time is calculated as the product of the round-trip travel time and the appropriate village level agricultural wage rate. For children the opportunity cost of the mothers' time is used.

The dominant private pr--iders are physicians. As was true with Côte d'Ivoire, very few individuals reported seeking care from a traditional healer, so we leave them out of the analysis. We use median private doctor prices paid by individuals in each department in our sample as monetary

prices. Again, the total price of private care is the sum of the village level monetary price and the opportunity cost of time.

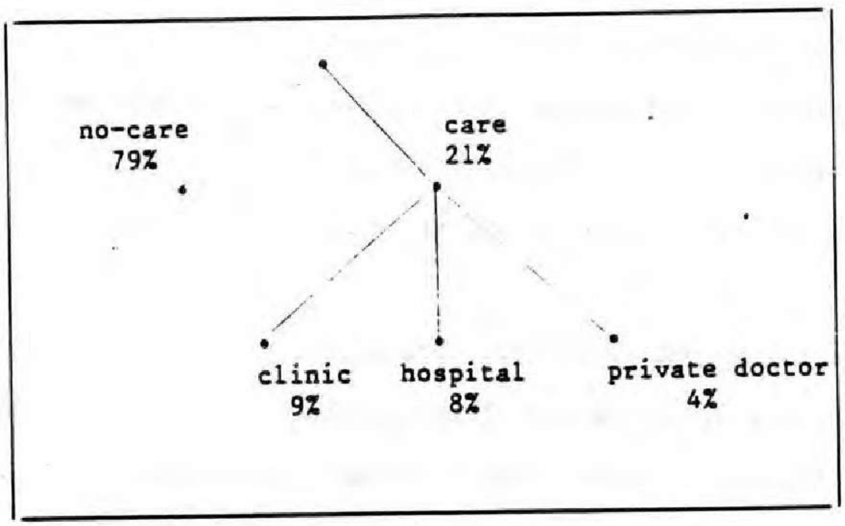
In the Peruvian specification, an individual experiencing an illness or accident has four alternatives: private doctor, government hospital, government clinic, or self-care. The distribution of provider choice in our sample is given in Figure 2. It is interesting to note that Peruvians who experience an illness or injury, use medical care only about half as much as Ivorians.

Consumption net of medical care expenditures for each alternative is computed as income minus the sum of the monetary price of the alternative and the opportunity cost of travel time. Income is computed as the annual value of total household consumption divided by 12, and the opportunity cost of time is the appropriate male or female wage rate times the round trip travel time.

The arguments of the alternative specific utility of quality functions are the same as used in the Côte d'Ivoire section. They are age, the number of healthy days last month, education, the number of other adults in the household, and the number of children in the household. Again, age is entered in spline form with the break occurring at 40 years old for adults and at 3 for children. Education is calculated as years of schooling with mother's education being used for children.

FIGURE 2: **Health-care Provider Choice**

in Rural Peru



In the Peru models, 37% of the households were excluded because they were in villages for which community level information was unavailable. A few visits for obstetrics and other preventive purposes were also excluded. The final sample included 1254 adults and 969 children under age 16 from 98 villages.

Thus, the main differences between the Ivorian and the Peruvian model are: (1) in Peru the patient has four, rather than three, choices and (2) the cost of obtaining care includes a monetary component as well as a travel time component. Note that rural Peruvians households are on average better-off than their Ivorian counterparts: In dollar terms, monthly per capita income is about $34 as compared to $23 in Côte d'Ivoire.

TABLE 7: Descriptive Statistics - Peru

	Adults		Children	
Variables	Mean	Standard Deviation	Mean	Standard Deviation
Clinic a/	.13	0.29	0.08	0.27
Hospital a/	.08	0.27	0.05	0.21
Doctor a/	.04	0.19	0.04	0.19
Clinic Price c/	1.32	0.76	1.37	0.86
Hospital Price c/	2.43	1.06	2.30	1.01
Doctor Price c/	22.27	16.57	23.95	16.59
Clinic Travel Time b/	2.02	2.68	2.30	2.70
Hospital Travel Time b/	4.56	6.23	4.83	6.11
Doctor Travel Time b/	3.54	2.92	3.56	2.88
Monthly Family Income c/	1262.24	1332.86	1320.35	1179.45
Hourly Wage c/	0.18	0.11	0.19	0.12
Age	43.52	18.11	6.52	4.48
Male a/	0.42	0.50	0.51	0.50
Education	2.28	2.76	3.25	3.60
Healthy Days	25.00	5.42	25.19	4.97
Number of Adults	3.16	1.35	2.71	1.05
Number of Children	2.62	2.01	3.83	1.59
Sample Size	1254		969	

a/ Binary variables; equals one if alternative is chosen and zero otherwise.

b/ Round trip travel time; reported in hours.

c/ Reported in June 1985 Peruvian Intis.

6.3.b Estimation Results

The results of maximum likelihood estimation of medical care provider choice models of Peruvian children and adults are presented in Table 8. As for Côte d'Ivoire, the coefficients on the consumption term and its square are significantly different from zero in both the adults' and children's models. These results confirm that the relative prices of the alternatives are important determinants of provider choice. The direction and magnitude of the price and income effects are examined in the next section. This section discusses the effects of the other variables. We begin with the adults' model and then turn to the results for children.

The estimated value of σ is .98 for adults and .44 for children. The estimate of σ in the adult model is significantly different from zero, but we could not reject the hypothesis that it is different from one. Therefore, the adult model is consistent with utility maximization, but the MNL is not rejected in favor of the NMNL. The estimates of in the children's model is significantly different from zero and from one. Therefore, the children's model is consistent with utility maximization, and rejects the MNL specification in favor of the NMNL.

Utilization of medical care by Peruvian adults over the life cycle differs from the use of health-care by adults in Côte d'Ivoire. The coefficients on the age splines indicate that an adult who experienced an accident or illness, is more and more likely to seek professional medical care as he or she ages until forty years old. After age forty, utilization continues to increase with age but at a slower rate.

Education has a strong positive effect on the decision to seek medical care. Moreover, educated individuals show a preference for the higher quality hospital and private care over the lower quality clinic care. This conforms better to results from developed countries than the Ivorian results on this issue. Generally, one finds that education strongly influences the decision to seek medical care, and that more educated individuals choose the higher quality options. This adds further to our belief that the negative education results for Côte d'Ivoire are due to the lack of variation in the education variable rather than reflecting a true education effect.

We find that females are much more likely to seek medical care to treat an illness or accident, and are more likely to choose hospital than private physician care or clinic care. This is the opposite to what we found in Côte d'Ivoire, but at this point we can only speculate about whether this is a gender-bias affect, the result of rational decisions based on the expected productivity of the individual, or the efficacy of the health care system in treating gender specific illnesses.

The other variables were commensurate with the Côte d'Ivoire results. Not surprisingly, the number of healthy days last month significantly reduces the probability of seeking medical care. The number of adults in the household has a negative effect on the probability of going to both clinics and hospitals, while the number of children has positive effects. Thus, families with more adults and fewer children are better able to care for sick family members at home, than are families with fewer adults and more children.

The results from the model for Peruvian children are in general similar to those from the Peruvian adult model and conform to most studies on medical care demand in developed countries. The age profile of health care utilization is identical to Côte d'Ivoire. Infants have the highest probability of seeking medical care to treat an accident or illness. The probability then falls with age until three years old and is flat thereafter, ceteris paribus.

We also found that more educated mothers are more likely to use clinic care. This result is consistent with previous work. Although we are not aware of studies that focus exclusively on children's health-care demand in developing countries, mother's education has been shown to have a strong positive effect on children's health status (e.g. Strauss, 1988). Medical care utilization by Peruvian children does not differ by gender, which matches what we found in Côte d'Ivoire.

TABLE 8: **The Nested Multi-Nomial Logit of Provider Choice Estimates for Peru**

Variable	Adults Coefficient	Adults t-Statistic	Children Coefficient	Children t-Statistic
Consumption*	5.13	(2.14)	6.88	(2.37)
Consumption squared**	-0.16	(2.26)	-0.21	(2.04)
Sigma	0.98	(2.03)	0.44	(1.71)
Private Doctor				
Constant	-1.04	(0.56)	-2.30	(1.99)
Age1	0.01	(0.40)	-0.59	(1.35)
Age2	0.01	(0.39)	-0.15	(1.84)
Education	0.18	(2.61)	0.00	(0.58)
Male	-0.26	(0.70)	0.61	(0.34)
Children	0.03	(0.31)	0.27	(1.91)
Adults	-0.45	(4.52)	-0.83	(2.36)
Healthy Days	-0.08	(3.34)	-0.26	(3.30)
Hospital				
Constant	-1.61	(1.63)	3.12	(1.15)
Age1	0.06	(3.48)	-0.63	(1.03)
Age2	-0.02	(1.47)	0.02	(0.42)
Education	0.20	(4.51)	0.06	(0.25)
Male	-0.69	(2.66)	0.35	(0.38)
Children	0.09	(1.46)	-0.12	(0.40)
Adults	-0.19	(2.59)	-0.75	(1.87)
Healthy Days	-0.11	(6.31)	-0.22	(2.38)
Clinic				
Constant	-1.65	(1.91	3.58	(1.39)
Age1	0.03	(1.65)	-0.06	(1.79)
Age2	-0.01	(0.45)	0.02	(0.42)
Education	0.10	(2.25)	0.12	(1.97)
Male	-0.03	(0.13)	0.43	(0.96)
Children	0.08	(1.34)	0.26	(1.70)
Adults	-0.06	(0.66)	-0.73	(2.38)
Healthy Days	-0.06	(3.64)	-0.23	(5.55)
Sample Size	1254		913	
Log Likelihood	-843		471	

* Variable was divided by 100 for estimation.
** Variable was divided by 100,000 for estimation.

6.3.c Price Elasticities

To show the effect of prices (total costs) on medical care utilization we computed arc price and travel time elasticities. Arc price elasticities of the demand for clinic, hospital, and private doctor care by income quartiles are presented in Table 9 for adults and Table 10 for children. The arc elasticities are calculated for three fee levels, ranging from 0 to 30 intes. Reading down a column of Table 9 or 10 shows the change in the price elasticity moving down the demand curve, holding income constant. Reading across a row of Table 9 or 10 shows the change in the price elasticity as income rises, holding price constant.

The estimates show that the price elasticity of demand falls with income so that poorer individuals are more price sensitive than are richer individuals. Indeed, the price elasticities increase from completely inelastic in the highest income quartile to being into the elastic range in the lowest income quartile, in both the adult and children models. These estimates are commensurate with our results from the Côte d'Ivoire analysis. They imply that user fees can be a significant source of income for the health-care system. They also indicate that user fees will be regressive and may substantially reduce the use of medical care by the poor. Again children's demand for clinic and hospital care is more price elastic than adult demand.

Note that the result that the price elasticity of demand falls with income implies that the willingness to pay for medical care increases with income. This result is very similar to one obtained by Birdsall, et al. (1983). Using a survey technique, in which households in rural Mali were

asked directly how much they would be willing to pay for improvements in health services and water supply, they found the income elasticity of the willingness to pay for these services to be around .35.

TABLE 9: ARC Price Elasticities by Income Quartile - Peru; Adults

Range of Price Change *	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)	Overall
Private Doctor					
0-10	-0.53	-0.36	-0.15	-0.00	-0.25
10-20	-0.91	-0.62	-0.25	-2.02	-0.38
20-30	-1.30	-0.87	-0.36	-0.03	-0.49
Hospital					
0-10	-0.57	-0.38	-0.16	-0.01	-0.26
10-20	-0.96	-0.64	-0.26	-0.02	0.39
20-30	-1.36	-0.91	-0.37	-0.04	-0.50
Clinic					
0-10	-0.31	-0.21	-0.08	-0.00	-0.15
10-20	-0.61	-0.40	-0.15	-0.01	-0.27
20-30	-0.95	-0.61	-0.23	-0.02	-0.39
Mean Income *	395	783	1267	2620	1286

* Measured in June 1985 Peruvian Intis.

TABLE 10: **ARC Price Elasticities by Income Quartile - Peru; Children**

Range of Price Change *	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)	Overall
Private Doctor					
0-10	-0.20	-0.16	-0.13	-0.06	-0.14
10-20	-0.44	-0.36	-0.27	-0.12	-0.29
20-30	-0.84	-0.66	-0.48	-0.20	-0.52
Hospital					
0-10	-0.67	-0.48	-0.22	-0.33	-0.41
10-20	-1.18	-0.83	-0.38	-0.05	-0.64
20-30	-1.72	-1.20	-0.54	-0.09	-0.81
Clinic					
0-10	-0.76	-0.53	-0.24	-0.03	-0.46
10-20	-1.28	-0.89	-0.41	-0.06	-0.68
20-30	-1.80	-1.26	-0.57	-0.10	-0.83
Mean Income *	395	783	1267	2620	1286

* Measured in June 1985 Peruvian Intis.

Arc travel time elasticities of the demand for clinic, hospital, and private doctor care were calculated for four ranges of one hour each, covering 0 to 4 hours. They are presented in Table 11 for adults and in Table 12 for children. Unlike Côte d'Ivoire, the travel time elasticities are small relative to the price elasticities. This is not surprising since the opportunity cost of time is a smaller small portion of the total price of medical care in rural Peru. When monetary prices are large relative to the opportunity cost of time, the monetary prices ration the market and time prices are relatively unimportant. In Peru, time costs are, on average, only 3% of the total private doctor price, 25% of the total hospital price, and 21% of the total clinic price. Therefore, we find much less reaction to

changes in travel time, than was the case in Côte d'Ivoire where - in the absence of money prices - the total cost equals the opportunity cost of time lost in obtaining care.

TABLE 11: **ARC Travel Time Elasticities by Income Quartile - Peru; Adults**

Range of Time Change *	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)	Overall
Private Doctor					
0-1	-0.04	-0.02	-0.01	-0.00	-0.02
1-2	-0.07	-0.04	-0.02	-0.01	-0.04
2-3	-0.09	-0.05	-0.04	-0.01	-0.05
3-4	-0.11	-0.07	-0.05	-0.02	-0.06
Hospital					
0-1	-0.03	-0.02	-0.01	-0.00	
1-2	-0.04	-0.03	-0.02	-0.00	-0.02
2-3	-0.06	-0.05	-0.03	-0.01	-0.04
3-4	-0.09	-0.06	-0.04	-0.01	-0.05
Clinic					
0-1	-0.03	-0.02	-0.01	-0.00	-0.02
1-2	-0.07	-0.04	-0.01	-0.00	-0.03
2-3	-0.08	-0.05	-0.02	-0.01	-0.04
3-4	-0.09	-0.06	-0.03	-0.01	-0.05
Mean Income **	395	783	1267	2620	1286

* Time is reported in hours.
** Income is measured in June 1985 Peruvian Intis.

TABLE 12: **ARC Travel Time Elasticities by Income Quartile - Peru; Children**

Range of Time Change *	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)	Overall
Private Doctor					
0-1	-0.04	-0.02	-0.01	-0.00	-0.02
1-2	-0.07	-0.04	-0.01	-0.00	-0.03
2-3	-0.10	-0.05	-0.02	-0.00	-0.04
3-4	-0.12	-0.06	-0.02	-0.00	-0.05
Hospital					
0-1	-0.04	-0.02	-0.01	-0.00	-0.02
1-2	-0.06	-0.03	-0.01	-0.00	-0.03
2-3	-0.09	-0.05	-0.02	-0.01	-0.04
3-4	-0.11	-0.06	-0.02	-0.01	-0.05
Clinic					
0-1	-0.03	-0.01	-0.01	-0.00	-0.01
1-2	-0.04	-0.02	-0.02	-0.00	-0.02
2-3	-0.06	-0.03	-0.02	-0.01	-0.03
3-4	-0.09	-0.04	-0.03	-0.01	-0.04
Mean Income **	395	783	1267	2620	1286

* Time is reported in hours.

** Income is measured in June 1985 Peruvian Intis.

6.4. Summary

In this chapter models of medical care provider choice were estimated using data from the Living Standards Surveys of rural Côte d'Ivoire and rural Peru. The Côte d'Ivoire model had government clinic and hospital care as provider alternatives, whereas the rural Peruvian model included private doctor care as well. These specifications reflect the actual institutional choices available to the population. In Côte d'Ivoire monetary prices were zero so that the market was rationed by the time costs involved in obtaining care from the providers. In Peru time costs were small relative to monetary prices. The models were estimated for children and adults separately. All models yielded similar price and income effects. The estimation results are overall consistent with common sense and economic theory.

Our primary purpose in estimating models of medical care provider choice is to evaluate the impact of charging user fees for government medical care services. In evaluating the effect of user fees, the cost recovery aspects must be balanced against the potential effects on utilization. Indeed, one of the rationales for providing free care is to reduce access barriers and increase utilization. This begs the equity question: are the utilization effects of user fees uniform across income groups? If poorer individuals' decision to use medical care are more price elastic than richer individuals', then user fees will be regressive in that they will reduce utilization of poorer individuals by more than richer individuals.

It is clear, then, that any ex ante evaluation of the user fee proposal requires knowledge of the demand function from which price elasticities can be calculated. Price elasticities provide information about

how user fees will affect utilization and revenues. Our estimates show that price is an important determinant of the decision to use medical care. In addition, we find that the price elasticity of demand falls in absolute value with income. More specifically, we find that demand is very elastic for individuals in the lowest income groups and completely inelastic for individuals in the highest income groups. These results are robust in that we observe them in both the Côte d'Ivoire and Peru models, for both children and adults.

Unlike most previous studies of the demand for medical care in the developing world, our results are quite consistent with the work on the demand for medical care in the developed world. The fact that we had access to high quality data and utilized a model that solves some of the shortcomings in previous studies are probably behind this.

Our bottom line is that user fees have a great potential for cost recovery, but that care must taken in implementing them. Uniform user fees can generate substantial revenues, but are very likely to reduce the utilization of medical care by the poor. Uniform user fees, then, would be regressive in that they act as access barriers to medical care for the poor but not for the middle and higher income groups. In the next section we will be more explicit about the policy implications of these findings, by using them to simulate the effect of introducing alternative health-care fee policies, in poor and better-off regions both in Côte d'Ivoire and Peru.

6.5 Appendix

In this appendix we report the estimation of the reduced form (misspecified) models employed in earlier work on the demand for medical aid in developing countries. The models were discussed in Chapter 5, sections 2 and 3. The purpose of this exercise is to provide results that are comparable to earlier work even though they cannot be interpreted structurally. In these models prices and income are entered linearly and income has alternative specific coefficients. In conjunction with the previous literature, the models are estimated as MNL's rather than as NMNL's. The data used to estimate alternative specific coefficients are described in chapter 6.

The results are presented in Table A1 for Côte d'Ivoire and Table A2 for Peru. It is interesting to note that statistically significant negative price effects are found in all four models. Moreover, income has a positive effect on health care demand and is statistically significant in most cases.

TABLE A.1: **Reduced Form Model of Provider Choice in Rural Côte d;Ivoire**

Variable	Adults Coefficient	Adults t-Statistic	Children Coefficient	Children t-Statistic
Price	-6.121	5.16	-6.055	8.02
Clinic				
Constant	-0.284	0.54	0.313	2.06
Income	0.002	1.84	-0.002	1.83
Age 1	0.012	0.091	-0.274	2.58
Age 2	-0.031	3.34	0.024	0.83
Education	-0.020	0.48	0.003	0.66
Holidays	-0.026	2.98	-0.024	2.02
Male	-0.106	-0.64	0.117	0.68
Children	0.040	1.48	0.057	1.98
Adults	-0.054	1.72	-0.110	2.48
Hospital				
Constant	0.096	0.16	0.653	1.43
Income	0.004	4.04	0.003	3.96
Age 1	-0.010	0.62	-0.338	2.37
Age 2	-0.042	3.93	0.014	0.38
Education	-0.028	0.57	-0.001	(0.08
Holidays	-0.057	5.56	-0.050	3.30
Male	0.0527	2.48	-0.081	0.35
Children	0.040	1.31	0.082	2.23
Adults	-0.068	1.71	-0.126	2.86
Log Likelihood	887.28		674.68	
N	1030		769	

TABLE A.2 **Reduced Form Model of Provider Choice in Rural Peru**

Variable	Adults Coefficient	Adults t-Statistic	Children Coefficient	Children t-Statistic
Price	-4.24	1.98	-8.39	2.25
Doctor				
Constant	-1.46	0.78	2.31	1.87
Income	0.19	1.21	0.35	1.81
Age 1	0.01	0.40	-0.27	1.35
Age 2	0.01	0.38	-0.13	1.77
Education	0.18	2.55	0.04	0.54
Male	-0.27	0.80	0.15	0.32
Children	-0.02	0.21	-0.26	1.86
Adults	0.45	4.29	0.47	2.34
Healthy Days	-0.68	3.27	-0.10	3.26
Hospital				
Constant	-1.95	1.96	1.82	0.99
Income	0.21	3.37	0.22	1.62
Age 1	0.06	3.58	-0.25	1.00
Age 2	-0.02	1.48	0.02	0.31
Education	0.20	4.44	0.01	0.22
Male	-0.68	2.62	0.17	0.48
Children	0.07	1.19	-0.06	0.44
Adults	0.17	2.24	0.28	1.72
Healthy Days	-0.11	6.20	-0.10	2.80
Clinic				
Constant	-1.80	2.08	1.04	1.19
Income	0.13	2.12	0.16	1.11
Age 1	0.03	1.65	-0.27	1.72
Age 2	-0.01	0.46	0.10	0.35
Education	0.10	2.16	0.07	1.90
Male	0.04	0.16	0.27	1.02
Children	0.02	1.19	-0.18	1.76
Adults	0.04	0.48	0.26	2.16
Healthy Days	-0.05	3.61	-0.11	5.51
Log Likelihood	830.83		469.08	
N	1254		913	

CHAPTER 7

Options for Policy Reform

7.1 Introduction

In previous chapters we argued that an ex ante assessment of the feasibility and desirability of introducing or raising user fees for medical care depends critically on consumers' responses to such a measure. More precisely, the potential for fees to generate revenues and the effects of fees on utilization and welfare depend on the price and income elasticities of demand. The major part of our research effort has been to generate reliable estimates of these elasticities.

Our results have demonstrated, among other things, that poorer people are much more sensitive to price changes than are the not-so-poor, so that the effects of price increases are likely to reduce the poors' utilization of medial care by more than the reduction of the population as a whole. How then can these findings be used to judge whether user fees can be introduced as an additional source of revenue, and to determine what fee levels can be set to prevent the poor from being effectively cut-off from obtaining medical care?

In this chapter we attempt to answer these questions by simulating the consequences of alternative price and reinvestment policies in various settings. For instance, in Côte d'Ivoire we try to evaluate whether it is financially feasible to locate a clinic in a poor remote village in the northern Savannah area. For Peru, we evaluate, among other things, pricing

policies for government clinics that take the private sector price responses into account.

The purpose of these simulations is to illustrate how, armed with the appropriate information, one can make rational decisions based on the trade-off between cost recovery and protecting the poor. Though in our examples we try to be as realistic as possible, moving from analytic results to specific policy recommendations requires a comprehensive assessment of the political, cultural and institutional specifics of the countries. These includes aspects of infrastructure, population trends, manpower planning and the fiscal and political environment. Therefore, actual policy should be based on a much more comprehensive analysis than is presented below, and our examples should be viewed as illustrations only and not as authoritative recommendations for the countries under study.

The analysis is limited to the trade-off between cost recovery and access. Our criteria to judge the feasibility and desirability of user fee policies are:

(1) the potential for raising revenues,
(2) changes in utilization patterns of medical care, and
(3) the welfare effects on the population, especially the poor

The first part of the chapter simulates various policy scenarios for Côte d'Ivoire, and the second gives examples for Peru. As always, the chapter ends with a brief summary.

In all cases the simulations are conducted by enumerating through the sample data. Two hypothetical villages are chosen from each country: one representing a population from the bottom quarter of the rural income

distribution and a second from the top quarter. Observations corresponding to the hypothetical villages are selected from our samples and used for the respective simulations. The simulations allow all relevant characteristics (education, family structure, wage rate, etc.) as well as income to vary across the villages.

Finally, we need to repeat that our model only incorporates the first visit to a provider. Since our model explains provider choice and not the total number of visits to a provider, we cannot simulate the effects of fees on follow-up visits. Therefore, we need to assume that the fee charged for the first visit covers the cost for the treatment of the entire illness episode, regardless of the number of follow-up visits (i.e. it is tantamount to a "registration fee" customarily charged at clinics in developing countries).

7.2 Policy Options in Rural Côte d'Ivoire

Background

In this section, we simulate the consequences of alternative fee policies in two different settings: a poor village in the Northern Savannah region of Côte d'Ivoire and a wealthier village in the West-Forest region. To make the exercise as realistic as possible, we start the analysis by presenting background information that is directly relevant to the issue at hand.

Rural Côte d'Ivoire can be divided into three regions: the Northern Savannah, and the East and West-Forest. Of the three, the Savannah is by far the poorest and the West-Forest the wealthiest. In the simulations we

consider a Savannah village whose residents would be in the bottom quarter of the rural income distribution in this area. Similarly, we use a wealthier than average West-Forest village (in the top quarter of this income distribution). The characteristics of these communities are given in Table 1. Except for the consumption variables, these characteristics represent average villages in their region.

Per capita consumption levels in 1985 in the relatively well-off West-Forest village (CFA 156,000) were about three times as large as in the poor Savannah village (CFA 60,000). Daily wage rates for agricultural workers in the West-Forest (CFA 700) were more than twice the rates in the Savannah (CFA 300). Virtually, all households in the Savannah are small farmers with three-quarters of them having less than five hectares of land available for cultivation. In comparison, three quarters of the farmers in the West-Forest have more than five hectares and twenty-five percent have over fifteen hectares.

The structure of agricultural production in the two regions is also very different. The major export crop in the Savannah is cotton which is grown by about one-third of the farms. Most of the other agricultural production in the Savannah is food for home consumption and for sale in the local markets. In contrast, the West-Forest is characterized by cocoa and coffee cultivation. These crops are the country's major export and source of foreign exchange. Over 90% of the farms in the West-Forest cultivate cocoa and/or coffee.

The economy of both regions is only partially monetized with a good portion of food consumption produced on the household farm. Health care expenditures are likely to come from the non-food budget which consists of

cash purchases and possibly from the monetized portion of the food budget. In the Savannah, the food share of total household consumption is 70%, leaving only CFA 18,600 per capita for non-food cash expenditures (Table 1). Sixty percent of food consumption is home produced, implying that an additional CFA 17,360 cash per capita is spent to purchase food. Thus, in the Savannah, the total cash budget is CFA 35,960 per capita or about 60% of total consumption.

TABLE 1: **Characteristics of Savannah and the West-Forest Villages**

	West-Forest	Savannah
Agricultural Daily Wage	CFA 700	CFA 300
Per Capita Consumption	CFA 156,000	CFA 60,000
Per Capita Food Consumption	CFA 93,600	CFA 43,400
Per Capita Non-Food Consumption	CFA 62,400	CFA 18,600
Per Capita Cash Expenditures	CFA 109,000	CFA 35,960
% Piped Water	85%	79%
% Latrine or Toilet Facilities	44%	20%
Closest Paved Road (km.)	1 km	9 km
Closest Medical Professional (km)	5 km	22 km
% Ill (last two weeks)	28%	34%
% of Ill Who Obtain Med. Care	45%	37%

Source: 1985 Côte d'Ivoire Living Standards Survey

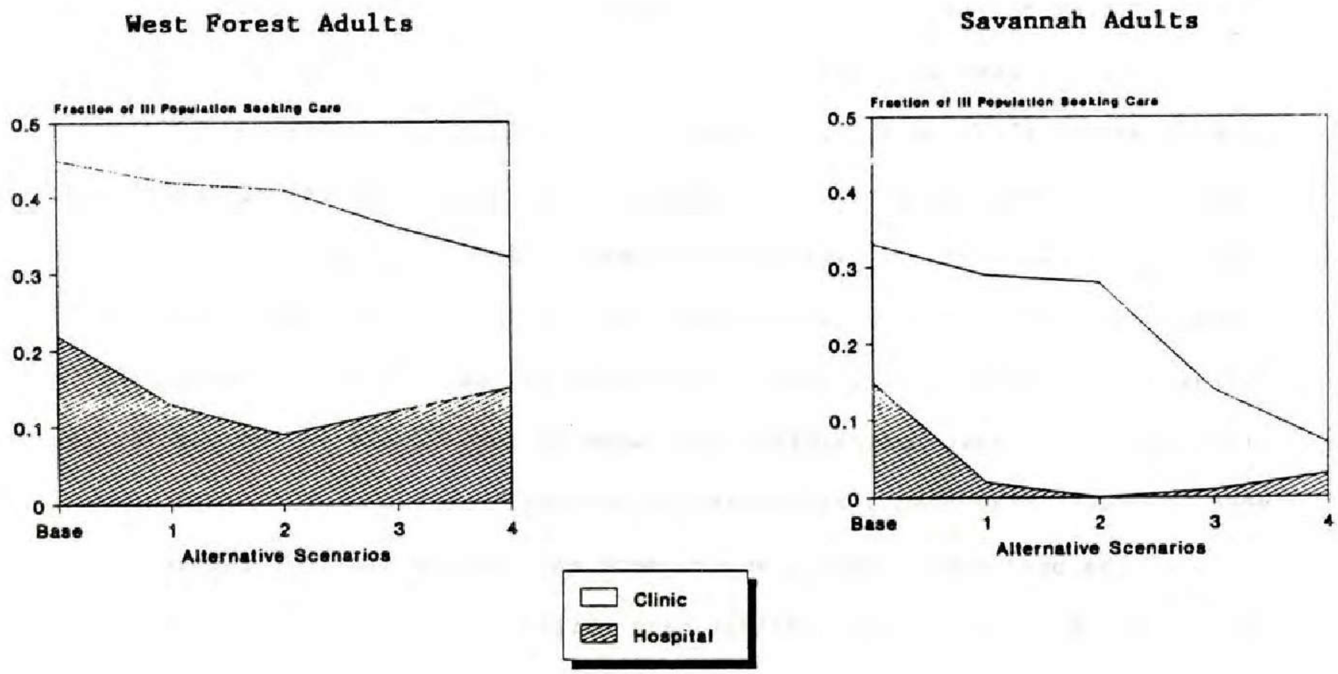
In the West-Forest much more money is available for cash expenditures. The food share is about 60%, leaving about cfa 62,400 per capita for non-food cash expenditures or about three and one-half times what is available in the Savannah. In addition, only 50% of the food budget is home produced, implying that cfa 46,800 cash per capita is spent on food. Total cash expenditure in the West-Forest, then, amount to about cfa 109,200 or about three times the amount spent in the Savannah.

The infrastructure and public health environment of a typical Savannah village reflects the region's relative poverty. Approximately 21% of the households do not have access to relatively clean piped in water and must obtain it from rivers, and 80% of the households have no latrine or toilet facilities. In contrast, only 15% of households in the West-Forest do not have access to clean water, and 56% do not have latrine or toilet facilities. The Savannah is more isolated than the West-Forest as the closest paved road is located, on average, 9 kilometers from Savannah villages, whereas the closest paved road is less than 1 kilometer from West-Forest villages. Moreover, individuals in the Savannah must travel on average 22 kilometers to nearest medical facility, whereas individuals in the West-Forest need to travel less than 5 kilometers on average.

The poor public health environment and poverty manifest themselves in the incidence of illness and medical care utilization. In the four weeks prior to the survey, approximately 34% of individuals living in the Savannah experienced an illness, whereas only 28% experienced an illness in the West-Forest. Of those who were ill, 37% consulted a medical professional in the Savannah, but 45% consulted a professional in the West-Forest.

Another piece of information useful for this exercise is the cost of providing medical care in Côte d'Ivoire. By knowing the cost of care we can evaluate the revenue potential in terms of costs recovered, and we can compare the willingness to pay for improvements in the system, relative to the costs of the improvements. Let us begin with clinic care. Clinics in rural Côte d'Ivoire are usually staffed with one nurse. A typical nurse's salary is CFA 115,000 per month. If a nurse were to spend between 20 and 30 minutes with each patient, a nurse could see about 400 patients a month. Hence, assuming

FIGURE 1: User Fee Simulations; Côte d'Ivoire



this patient load, the average labor cost per visit is CFA 285. In addition to labor, the major source of variable costs is drugs, which come to about CFA 315 per visit (Over 1988). Hence, the average cost per visit is about CFA 600. We will assume that the marginal cost of hospital care is the same as clinic care, while recognizing that hospitals have substantially higher fixed costs.

User Fees Without Reinvestment

As mentioned earlier, clinics and hospitals in Côte d'Ivoire currently do not charge user fees. To investigate what might happen to the utilization of these facilities if the government raised user fees, we consider the following options sequentially:

price scenario (1): raising hospital user fees to CFA 300

price scenario (2): raising hospital user fees to CFA 600

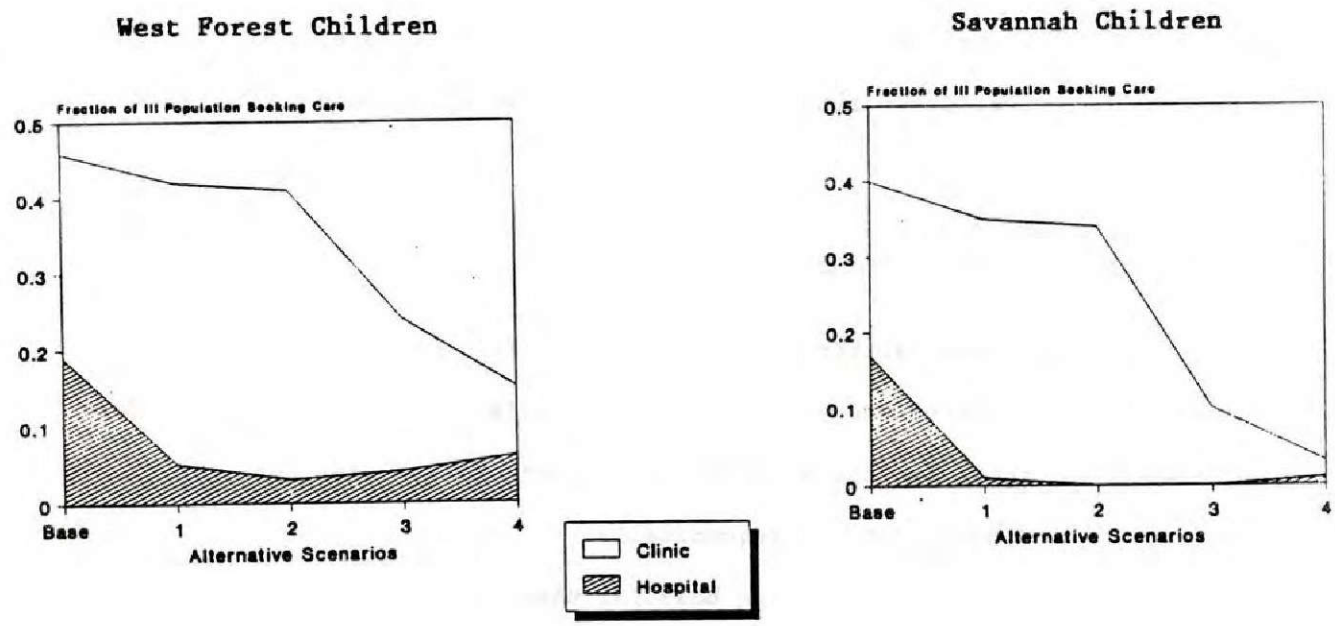
price scenario (3): raising clinics user fees to CFA 300 and maintaining the hospital fee at CFA 600

price scenario (4): raising clinic user fees to CFA 600 and maintaining the hospital fee at CFA 600.

These levels were chosen to correspond to charging approximately half of marginal cost (CFA 300) and all of marginal cost (CFA 600). Thus, at capacity (400 visits) these clinic fee levels correspond to half cost recovery and full cost recovery, respectively.

The results of the policy simulations are pictured in Figure 1 for adults and Figure 2 for children. The estimated fraction of the ill population choosing each alternative for the various pricing schemes is given along the vertical axis for each of the four price scenarios and for the base case with zero fees.

FIGURE 2: User Fee Simulations; Côte d'Ivoire



We begin with the base case where no fees are charged for both hospitals and clinics. This base case corresponds to the actual current situation. In this case, the opportunity cost of travel time rations the market. In the relatively well-off West-Forest village, where per capita income is higher and medical care facilities are closer, the use of medical care is substantially higher. Specifically, 45% of ill adults and 46% of ill children seek medical care, whereas in the poor Savannah village only 33% of adults and 40% of children seek care.

The response to price rises differs dramatically between these two hypothetical villages. At full cost recovery for hospitals (CFA 600), the number of adults in the West Forest seeking care is about 41% or a fall of about 9%, whereas adult utilization in the Savannah village falls to 18%, or a reduction of about 55%. Similar relative responses are observed for children as well. When fees are increased to full cost recovery levels in clinics (CFA 600) as well as in hospitals, both adults and children are effectively priced out of the market in the Savannah as utilization of adults drops to 7% and children to 3%, whereas in West-Forest 32% of adults and 15% of children still seek care.

One of the advantages of the nested multinominal logit specification is that it allows cross-price elasticities to differ across alternatives. Notice in Figures 1 and 2 that as we begin to increase the hospital fee most of the reduced hospital demand shifts to clinic care as opposed to self-care. Hence, user fees at hospitals can shift demand to clinics without substantial reductions in total utilization.

It is interesting to note that at zero prices children's utilization rates are about the same as adults' in both the West-Forest and the

Savannah. Then, as prices rise, children's' demand falls faster than adults' so that at full cost recovery prices, children's' utilization is lower than adults.

Earlier in the discussion we implied that a fee of CFA 600 would generate enough revenues to cover the variable costs of clinic care. This of course relied on the assumption that there would be approximately 400 visits per month, i.e. enough visits to cover one full-time nurse's salary plus the cost of drugs. For planning purposes it is important to take into account the aggregate demand response to determine if there is sufficient utilization. The question is, then, what size communities will support clinics at the various cost-recovery levels. From the information on the probabilities of seeking care and the probabilities of experiencing an illness reported in Table 1, we can derive the approximate population necessary to generate 400 visits to a clinic. These are reported in Table 2 for the three fee levels: zero cost recovery, half cost recovery, and full cost recovery. These estimates were derived under the assumption that hospitals charged a user fee of CFA 600.

TABLE 2: Population Necessary to Generate 400 Visits

	Hospital Price	Clinic Price	Population West-Forest	Population Savannah
Zero Cost Recovery	600	0	1,750	3,650
Half Cost Recovery	600	300	1,900	8,100
Full Cost Recovery	600	600	2,850	20,300

At zero cost recovery a population of about 1,750 in the West-Forest and about 3,650 in the Savannah would support a clinic. At fees levels that would cover about half of costs, the population necessary to support a clinic in the Savannah is about four times the size in the West-Forest, and for full cost recovery the Savannah population has to be seven times bigger. The large differences in the population necessary to support a clinic reflect the dramatic differences in utilization rates in the two regions at the CFA 300 and CFA 600 fee levels.

<u>User Fees With Reinvestment</u>

As discussed earlier, when monetary prices are low the opportunity cost of time rations health care demand. Typically, medical care facilities are located much closer to patients in the wealthier regions (urban) than in poorer regions (rural). In rural Côte d'Ivoire, individuals living in the West-Forest travel on average less than one-half hour one-way to a clinic, whereas Savannah residents must travel more than one and one-half hours on average. Thus, a uniform fee schedule implies a regressive pricing policy even at zero monetary cost.

In this section, we evaluate the effect on consumers' welfare of the proposal to locate clinics in villages the currently have no facilities and then charge user fees for access. The benefit to individuals from implementing this proposal depends on whether the reduction in welfare resulting from having to pay user fees is less than the improvement in welfare from having access to medical care facilities within the village. The welfare neutral fee is the amount consumers would be willing to pay not to have to travel (i.e. the compensating variation). If the welfare neutral fee is more

than the marginal cost of medical care, the policy is welfare improving. On the other hand, if the welfare neutral fee is less than the marginal cost, then the policy would reduce welfare.

The welfare neutral prices are derived from compensating variation experiments. Three welfare neutral prices are calculated for an average individual in each of the two hypothetical villages; how much an individual is willing to pay not to have to travel to a free clinic that is currently 1 hour away, 2 hours away, and 3 hours away. The experiments are conducted assuming that the closest hospital is 4 hours away and charges a user fee of CFA 600.

The welfare neutral prices are reported in Table 3. Reading across a row shows the change in willingness to pay as it depends on the current distance to the clinic. Of course, the welfare neutral prices increase with this distance for both children and adults in both villages. West-Forest residents are willing to pay one and one-half times as much as adults in the Savannah. The welfare neutral fees are 5% and 15% of the marginal cost of providing clinic care. Hence, implementing the proposal to locate clinics in villages and charge users marginal costs will lead to a reduction in welfare. For the policy to be welfare improving, a subsidy of approximately 90% is required.

Before drawing the most important policy implications of these results, we will simulate the outcome of a similar set of policy alternatives for two hypothetical villages in Peru.

FIGURE 3: User Fee Simulations - Peruvian Adults

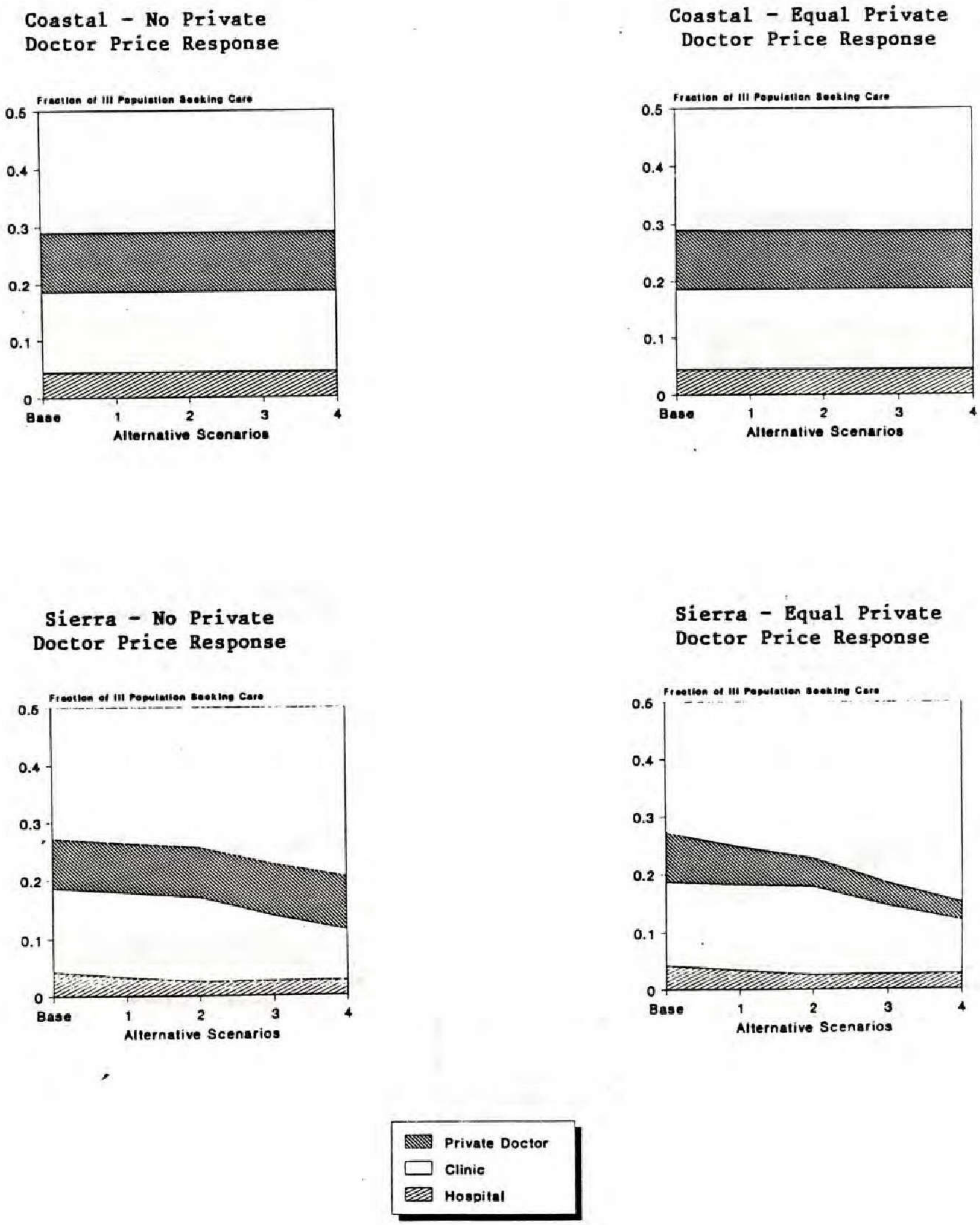


FIGURE 4: User Fee Simulations - Peruvian Children

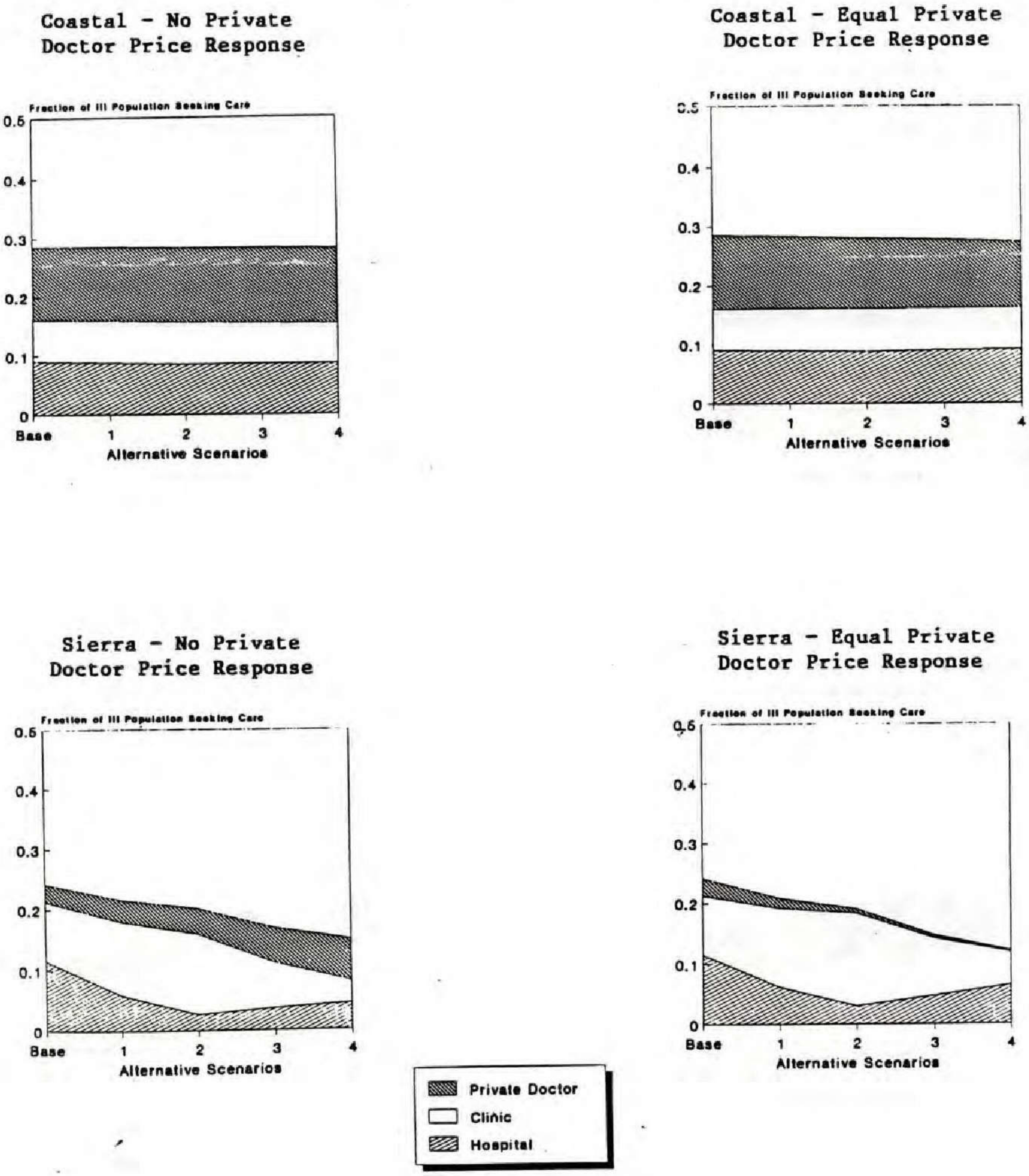


Table 3: **Willingness to Pay (CFA) For Reduced Travel Time**

	Travel Time to Clinic		
	1 Hour	2 Hours	3 Hours
West-Forest Adult	46	62	78
Savannah Adult	16	22	27
West-Forest Child	28	46	57
Savannah Child	14	19	38

7.3 Policy Options in Rural Peru

Peru can be decomposed in three large regions: the Forest, the Sierra, and the Coast. Of the three the Sierra is by fare the poorest and the Coast the richest. Residents of the Sierra are among the poorest in the world and their incomes are similar to that of residents of the poorest regions in Côte d'Ivoire. On the other hand, residents of the Coast are quite well off and indeed are much wealthier than residents of the West Forest region in Côte d'Ivoire. In this section we will simulate the likely effects of various user fee policies in two hypothetical villages: a poor village in the Sierra whose residents are in the bottom quarter of the rural Peruvian income distribution, and a wealthy village on the Coast whose residents are in the top quarter of that income distribution.

The characteristics of these two villages are presented in Table 4. The differences in wealth are apparent. Average agricultural workers' daily wage rates in the Coast are twice those in the Sierra, and per capita annual consumption in the Coast (2520 intis) is approximately two and one-half times per capita consumption in the Sierra (960 intis). In the poorer Sierra, about

76% of total consumption is spent on food, leaving only 230 intis per capita. In the Coast, only 60% of the total consumption is spent on food, or - in absolute value - over three times what is spent in the Sierra.

The infrastructure and public health environment reflects the relative poverty of the Sierra as well. Only 10% of households in the Sierra have access to relatively clean piped in water, and the rest must obtain it from rivers and streams. In the Coast, 58% of households have piped in water. Only 31% of households have latrine or toilet facilities in the Sierra, whereas 41% have these facilities in the Coastal area. Moreover, the closest medical facility is 4 hours travel time on average from Sierra households, and only 1.25 hours from Coastal households.

These differences manifest themselves in morbidity rates and in the utilization of health care. In the Sierra, approximately 43% of all individuals experienced an illness in the four weeks prior to the survey, and 24% of them sought formal medical attention. On the other hand, only 30% of Coastal residents experienced an illness, and 30% of them sought formal medical attention.

TABLE 4: **Characteristics of the Sierra and Coastal Villages**

Variable	Sierra	Coast
Daily Ag. Wage Rate	1.3	2.6
Per Capita Total Consumption	960	2520
Per Capital Food Consumption	730	1590
Per Capita Non-Food Consumption	230	930
% Piped water	10%	59%
% Latrine or Toilet Facilities	31%	41%
Closest Medical Professional	4 hrs	1.25 hrs
% Ill (last four weeks)	43%	30%
% of Ill Who Obtained Med. Care	24%	30%

Finally, we need information on the recurrent costs of medical care. Data from the PLSS indicate that a nurse's monthly income is about 1000 intis on average. Assuming approximately 400 visits per month, this implies an average labor cost of about 2.5 intis per visit. Drugs costs for respiratory and digestive problems average 15 intis (Gerrafi, 1987). This amounts to an average cost of about 17.5 intis per visit.

User Fees Without Reinvestment

Currently, government clinics and hospitals charge small user fees - from 1 to 5 intis depending on the region. In this section we evaluate the likely effects of increasing user fees to half and full cost recovery levels. Unlike Côte d'Ivoire, Peru has a large private sector. Increases in prices at government facilities are likely to shift demand to the private sector. The increased demand may cause private doctors to increase their prices, and consequently further reduce the number of ill individuals that

obtain medical care. Thus, a complete evaluation of user fees requires one to take into account the private doctor supply response. Unfortunately, we have no information about the slope of the private doctor supply function. Therefore, we will consider two extreme scenarios under the belief that the likely scenario is somewhere in between. The two scenarios are: no private doctor price response, and an increase in private doctor prices equal to the increase at public facilities.

We first consider the impact of charging user fees at hospitals and consider the effects of extending them to clinics. Again we consider fee levels at the half and full cost recovery levels. We begin by simulating a base case in which clinic and hospitals charge zero fees. It is important to note though that this is not reflective of the current situation as government facilities currently charge small fees. The user fee simulations are:

Price Scenario (1) raising hospital fees from 0 to 7.5 intis

Price Scenario (2) raising hospital fees from 7.5 to 15 intis

Price Scenario (3) maintaining hospital fees at 15 intis and raising clinic fees from 0 to 7.5 intis

Price Scenario (4) maintaining hospital fees at 15 intis and increasing clinic fees from 7.5 to 15 intis.

These user simulations are performed twice: once assuming that the private sector does not respond at all to changes in the price of public health services. The second set of simulations assumes that private doctors raise their prices by an amount equal to the increase in public facility fees. The results of the policy simulations are reported in Figures 3 and 4, which show

the faction of the ill population that obtains medical care from each of the available alternative providers, including self-care, for each of the above price scenarios.

The base-case in Figures 3 and 4 refers to the situation under which hospitals and clinics do not charge a user fee. In the base-case, 29% of adults and children from the relatively well-off coastal obtain professional medical-care to treat an accident or illness. In the poorer Sierra village, 27% of adults and 24% of children seek professional medical-care.

As was that case for Côte d'Ivoire, the utilization response to increase in user fees is dramatically different in the two villages. The figures show that charging user fees at full cost recovery levels at both hospitals and clinics has negligible effects of the utilization of professional medical care by both adults and children from the Coastal village. On the other hand, raising user fees in the Sierra clinic and hospital does have large utilization effects. Let's begin with the scenario in which there is no private doctor price response. Under this assumption, an increase in fees in the Sierra region to full cost recovery level at hospitals (price scenario 2), reduces adult hospital demand by about 42% and children's demand by about 76%. Total adult medical care utilization falls by about 6% and total children's utilization falls by about 16%. An additional increase in clinic fees to full cost recovery levels (price scenario 4) reduces adult clinic demand by 39% and children's' clinic demand by 62%. Moreover, at full cost recovery fee levels total adult demand falls by 24% and total children's' demand falls by 38%. Under the assumption of equal private doctor price response the reduction in total utilization is even larger. At full cost recovery fee levels (price scenario 4) total adult demand is reduced by 44% and total children's demadn by 46%.

Now we calculate the population base necessary for a clinic to be financially self sufficient. Table 5 reports the population necessary to generate 400 clinic visits a month under the various price scenarios. We begin with full cost recovery fees at hospitals and zero fees at clinics. Notice that the population base in Sierra is smaller than in the Coast for the first two price scenarios. This because the probability of developing an illness is greater in the Sierra than on the Coast. Another interesting point is that the population bases at the lower coast recovery scenarios are larger than in Côte d'Ivoire. This is because both the illness probabilities and utilization rates are higher in Côte d'Ivoire than in Peru.

TABLE 5: **Population Necessary To Support A Clinic**

	Coast No Price Response	Coast Equal Price Response	Sierra No Price Response	Sierra Equal Price Response
Price Scenario 2	17,400	17,100	9,600	8,800
Price Scenario 3	18,100	17,300	15,000	12,700
Price Scenario 4	18,[illegible]0	17,400	26,200	20,300

User Fees with Reinvestment

In this section we investigate the feasibility of improving access to clinics by reducing travel time and charging users the recurrent cost of operating the new facilities. In this way we can evaluate the possibility that increased access to medical care can be self-financed by users. Again we do so by calculating the welfare neutral fees. Which are the prices which people are willing to pay to avoid traveling long distances to obtain medical care. Recall that the willingness to pay is calculated as a compensating variation using the formulas derived in the previous chapter. Three welfare neutral prices are calculated for an average individual in both villages: the amount an individual is willing to pay not to have to travel 1 hour, 2 hours and 3 hours to a clinic, respectively. The experiments are conducted assuming that the closest hospital is 4 hours away and charges a user fee of 15 intis, and a private doctor is 2 hours away and charges 20 intis.

The welfare neutral prices are reported in Table 6. Reading across a row indicates the change in the welfare neutral price as the travel time rises, and reading down a column indicates how the price changes as income rices. Residents of the Sierra village are willing to pay almost nothing to avoid traveling, while residents of the Coastal village are willing to about

10% of the recurrent costs of operating a clinic.

Table 6: **Willingness To Pay For Reduced Travel Time To A Clinic**

	1 Hour	2 Hours	3 Hours
Coastal Adult	.56	1.07	1.54
Sierra Adult	.00	.01	.02
Coastal Child	1.01	1.94	2.80
Sierra Child	.03	.06	.09

7.4 Conclusion; Policy Implications

In this section we used the estimated demand functions from the previous chapters to simulate the likely effects of various user fee policies in two hypothetical villages in the two countries under study: one poor village and one richer village in each country. Though both countries are very different, the simulation results are quite similar. The results indicate that user fees at half and full marginal cost levels would effectively price residents for the poorer communities out of the medical care market. Alternatively, user fees at these levels do not seem to substantially deter medical care utilization by residents of the wealthier village. Thus, it appears that user fees are a potential source of substantial revenues for the health-care sector, but poorer communities need to be protected from the adverse effects on utilization of the implementation of substantial fees.

Two other simulation results have immediate policy implications. First, charging fees for higher levels of care (e.g. hospitals) clinic care, generally causes individuals to substitute to other types of care rather than to drop out of the medical care market. Secondly, user fees seem to have a greater negative effect on childrens' utilization of medical care than on adults'.

The simulation results on charging fees while reducing travel time to zero, show that this policy would substantially reduce welfare and utilization both in the richer and poorer villages. Hence, this (extreme) type of expansion of the health care system in rural areas cannot be completely user-financed and requires about a 90% subsidy to be welfare improving.

Finally, let us place these results in a family budgetary context. Given the probabilities of experiencing an illness, the probabilities of seeking medical care, and the cost of care, we can derive the ex ante subsidy provided to an individual when medical care is provided free of charge. Zero user fees imply an annual subsidy of about CFA 1,460 per capita in the wealthier Ivorian villages and CFA 960 per capita in the poorer village. The subsidy amounts to 0.9% of the total budget for wealthy families and about 1.6% of the total budget for poorer families. Since medical care is likely to be purchased at the expense of non-food items, the budget shares become even larger. The subsidies amount to 2.3% of non-food expenditures for wealthy families and 5.2% poorer families.

For Peru the annual per capita subsidy to residents of wealthier villages such as our Coastal example is 30 intis, while the subsidy to residents of poor villages such as our example from the Sierra is 43 intis. This amounts to 1.2% of total consumption for the wealthier family and 4.5 of total consumption for the poor family. With respect to non-food expenditures, this amounts to 3.2% of the non-food budget for the wealthy families whereas the subsidy to the poor is about 18.7%. Our results can be summarized by pointing out the people who are willing to pay 2% to 3% of their non-food budget for medical care, but are not willing to pay 5% or more.

CHAPTER 8

Conclusion

8.1 Some Collaborative Evidence for the Main Results

The main analytical result of this study is that the demand for medical care is responsive to price changes. Moreover, the price elasticity of demand falls with income. The result that demand is price responsive is in accordance with most of the literature on developed countries as well as with a few recent studies on the developing world (Cretin et al., 1988; Alderman and Gertler, 1988 and Mwabu, 1988), but contrast sharply with earlier studies on the demand for medical care in LDCs. Indeed, a review of this early evidence on price responsiveness led to the conclusion that prices are not relevant in the decision to seek medical care (World Bank, 1987). In our review of the literature in chapter 5 we presented various reasons for this negative, and - given the evidence available from developed countries - paradoxal finding.

All studies mentioned, including our own, draw their conclusions from the statistical analysis of cross-sectional sample data. Observing the behavior of households and individuals who currently face different prices and other access costs, demand equations are postulated and estimated and the obtained coefficient for the price effect is statistically tested against the null-hypothesis of a zero price effect. Ideally, one would like to conduct various experiments in which alternative price regimes are being implemented and before and after utilization patterns compared. Given that this is

conceptually straightforward, the lack of such experiments is surprising. In fact, we were able to find just one study that reports on such a before and after evaluation.

Dr. Enyimayew, in a paper presented at the WHO Workshop on Financing Drug Supplies held in Zimbabwe March 1988 (Enyimayew, 1988), reports results from the Ashanti-Akim experience in Ghana. After the introduction of user fees in 1985, attendance dropped to one-quarter of the previous level. In the larger urban-based health stations attendance recovered quickly, but 2½ years after the introduction of user fees, small rural based stations that serve primarily the poor see only a fraction of the patients they saw before and operate at less than half of their optimum level (op. cit. p.11-a). This result is strikingly similar to the simulation results presented in Chapter VII: user fees can be introduced in relatively well-off regions without having a major impact on health-care utilization, but user fees will constitute an effective access barrier to medical care for the poor.

Other collaborative "real world" evidence for our analytical findings is more anecdotal. For instance, Dunlop in a study on Ethiopia reports that revenues for outpatient care actually decreased after a fee increase was implemented, implying that the price elasticity of demand exceeds - 1.0 in absolute value (Dunlop, 1987). However, this study also reports arc price elasticities of between .05 and .50, so the evidence is mixed, except for the fact that demand is sensitive to prices. Bao (1987) reports that about half of the ill peasants in Hubei Province, China, who do not obtain medical care, report the high price as the major deterrent. Two thirds of the poor in the mountainous areas say not to seek care because the price is too high.

In sum, we are quite confident that our main findings are correct and should be taken seriously by those who propose to charge user fees as a means of generating revenues for health-care delivery. At the end of this chapter we will summarize the policy implications of our findings. But first we will draw attention to some of the shortcomings of our study and thus, inter alia, sketch an agenda for future research.

8.2 Suggestions for Future Research

The most obvious next steps necessary to improve our understanding of the determinants of the demand for medical care would involve an extension of the model we used into a more detailed investigation of the determinants of more specific aspects of health-care utilization. The extension is necessary since we restricted the analysis to the choice of provider only. It is conceptually straightforward to include the total number of visits, as well as outlays for follow-up consultations. We would also have liked to be more precise about the total access costs, including, for instance, out-of-pocket transportation costs. The data requirements for such an extension are large, but not prohibitively so. A carefully prepared household survey focusing on health and medical care utilization could incorporate questions to obtain such information.

It will be somewhat more difficult - but not less important - to become more specific about exactly what is meant by "the demand for medical care". For instance, the willingness to pay for preventive care is probably quite different from the willingness to pay for curative care. The price elasticity of drugs and the demand for care for chronic diseases will differ

from acute care, emergency care and for maternal and child health care. Our study focussed on the demand for acute primary outpatient care. Subsequent research should focus on specific types of medical care. This, by itself, does not cause any conceptual difficulties. It does imply, though, that much more attention needs to be paid to the measurement of health status. Self reported health status (days lost for normal activities due to an illness or injury) is likely to contain insufficient information if one is interested in explaining the choice between, say, visiting a mid-wife or a hospital emergency clinic.

Others would argue that health status should be treated as endogenous (e.g. Strauss, 1988). While this is theoretically correct, we did not find any impact on our estimation results when removing "endogenous" health status measures. Again, this issue may become very difficult to deal with empirically if health-care type specific demand equations are being estimated using illness specific health status measures. This analysis requires a longitudial design where patients are followed over time so that specific investments (use of medical care) can be evaluated on their effect on future improvements in health.

There are various aspects related to the main issue of health-care financing through user fees that we have not adequately addressed and that, we think, deserve high priority from the health-economic research community.

The first one relates to the effect of the quality of care (e.g. the amount of training received by the doctor; the availability of drugs and diagnostic equipment) on the demand for care. The demand equation may shift if the quality of the services provided increases. If such a shift is large enough, it may offset the negative effect on utilization of an increase in the

price of care. This is an empirical question that can and should be researched using provider-specific data in conjunction with household survey data.

The second issue relates to the responses of the private sector to pricing policies in the public health-care sector. As we demonstrated in the policy simulations for Peru, potential revenues for the public sector may "leak" to the private sector if fees for government clinics are raised. Though this is not necessarily a negative development (it may for instance free an over-burdened public sector to focus on providing care to the poor) it may have significant consequences in terms of revenues raised. A better understanding of the the private sector supply responses in the health-care sector (will the private sector increase its price in response to the increase in demand? Or will it expand its facilities?) is necessary to come to a more complete judgment about the feasibility of financing medical care through user changes.

Finally, we feel that much more work can be done to better target public health-care facilities to benefit the poor. Even in a relatively small country like Côte d'Ivoire, regional differences in welfare levels are relatively large. Given our simulation results, it does make sense to subsidize medical care in such areas as the Savannah in Côte d'Ivoire and the Sierra in Peru. At the same time user fees can be introduced in the better-off areas without large negative effects on utilization. If welfare differences are very large, some form of cross-regional subsidization may become a desirable and feasible option. But more can be done in this area.

One way to protect the poor is to provide them with health-insurance. Very little analytical work is being done in this area since

targetting the poor is very difficult without a reliable income reporting system, and these systems do not exist in many developing countries. But, for example, in countries where governments have created a monopoly on export crops grown by small farmers, one could think of earmarking a tiny percentage of the revenues of these crops for providing health-care insurance to these farmers. For the case of Côte d'Ivoire, this would especially be beneficial to a large group of the poor, if the emphasis was on cotton growers. Alternatively, just as one can think of regional variation in subsidizing health-care delivery, one can imagine region-specific (or even village-specific, say, based on export crop production) subsidies for health insurance schemes. Clearly, the ramifications of such policies need to be worked out further, but the examples suggest that there are many alternatives to the customary across-the-board subsidy schemes that, in practice, always turn out to be regressive. More analytical work in this area is needed, as well as more innovative real world experimentation.

8.3 Suggestions for Policy Implementation

We conclude by listing the four most important findings of our study and providing some suggestions on how - given these findings - user fee policies can be implemented while trying to protect the poor.

- the demand for medial care is price sensitive
- the poor are more price sensitive than the rich
- child care is more price elastic than adult care
- alternative health-care providers are closer substitutes than health-care providers and self-care.

Do these results imply that user fees should not be introduced as a source of revenues for the health-care sector? Not at all. Demand overall is price inelastic with an order of magnitude about -.2 to - .4, implying that increases in prices will raise substantial revenues. In addition, there are many good reasons other than resource mobilization for reintroducing price signals in the health-care system (e.g. World Bank, 1987). What the results imply is that just as providing medical care free of charge to the entire population is an unattainable and regressive policy, so will the across-the-board introduction of user fees be regressive and - in poor areas - unattainable.

The first result, that the demand for medical care is responsive to price changes, has straightforward implications for revenue potential: since the demand for medical care will fall if prices are raised, revenues will be lower than without a price response. This is particularly the case if there are close substitutes for public facilities (private care).

The second result implies that the revenue potential in poor areas is very low. Clinics in poor areas can not survive financially unless they are heavily subsidized. The poor's willingness-to-pay for medical care is so low that they are effectively being priced out of the market by fees that are even just a fraction of marginal costs. Our results indicate that fees can be charged without a significant drop in utilization if the cost of medical care takes no more than 2 to 3 percent of the household's non-food budget. Though we are hesitant to prescribe this number as a rule of thumb, it does suggest that the estimated budget share for medical care can give a first indication about the feasibility level of user fees. The practical implication of these results is that uniform user fees are regressive and that some sort of price

discrimination is necessary to simultaneously achieve cost-recovery and equity goals. In countries without good income records, targetting the poor for price discounts is administratively difficult. One immediate alternative is geographic price discrimination: Charge lower prices for facilities that primarily serves low income groups. In addition, policy makers may want to opt for the gradual introduction of user fees, starting at a level that will result in expenditures of no more than about 2 percent of the household non-food budget. Careful evaluation of the changes in utilization patterns resulting from such charges should provide guidance for subsequent policies regarding the fee levels. Of course, such an approach implies that fees in poorer areas have to be set well below those in better-off regions.

If our third result, that child care is more price sensitive than adult care, holds up to further scrutiny, it contains again a strong warning against the across-the-board introduction of user fees. Clearly it would be penny-wise and pound-foolish for a developing country not to invest in the health of its younger generation. With human capital formation one of the driving forces of economic development, there is much to be said for providing medical care to children who need it. It would be logistically simple to exempt child-care from increases in the fee structure for medical care, or at least to differentiate between fees for child health-care and adult care. The humanitarian argument would make such a differentiation politically feasible. If our results turn out to be generally true, such a policy would also make good economic sense.

Our final result, that the increase in the price of one provider is more likely to lead patients to turn to another provider rather than to opt for self-care providers, provides another suggestion for a differentiated

introduction of user fees in the health-care system. The result suggest that one should start to charge for higher levels of care (say, hospitals). If, after the introduction of, or increase in fees, the demand for hospital care decreases significantly, while the demand for clinic care increases, any increase in the charge for clinic care is likely to result in an overall reduction of medical care utilization. If, on the other hand, the demand response to the hospital fee is modest, one can experiment with a gradual introduction of fees in the lower echelons of the health-care system.

The overall message to policy makers is thus one of gradation and differentiation. The best policy advice will be derived from carefully monitoring the impact of real world experiments. The selective introduction of modest fees, followed by a careful evaluation of the resulting changes in health-care utilization patterns, will provide the policy guidance for subsequent fee policy measures or for corrective actions.

In the early chapters of this book we underscored the importance of health in the development process. We highlighted the poor state of the existing health-care infrastructure and joint the numerous analysts and policy makers who point at the need for more financial resources to improve the situation. Given the current economic climate and the tight fiscal policies many LDCs have to follow to return to a path of sustained economic growth, additional financing is unlikely to come from government resources. Are user fees the answer? This study has shown that, in general, user fees can generate significant revenues, if introduced carefully. The best policy is likely to be one that starts with charging modest fees for higher level care. Fees approaching the marginal cost of care, however, will effectively

cut the poor out of the health-care market. Thus, large subsidies continue to be necessary for providing medical care to the poor.

In the past many countries have opted to eliminate all financial barriers to obtaining medical care. This has lead to a resource-starved health-care system in which the limited supply of services is rationed by non-price mechanisms. In spite of all the good intentions, the result is a highly inequitable, regressive distribution of public health services. User fees can significantly increase the resources necessary for improving the health-care system. If these fees are introduced in a differentiated way, the policy can at the same time generate revenues and improve the equity of the system. On the other hand, if no special measures are being taken, a user fee policy will perpetuate the inequitable distribution of health-care in the developing world.

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THE WILLINGNESS-TO-PAY FOR MEDICAL CARE

Evidence from Two Developing Countries

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The Willingness-to-Pay for Medical Care: Evidence from Two Countries

Table of Contents

Acknowledgments

[To be written]

Guide to the Reader

Readers who want to get a quick overview of the contents of this book are advised to read the Introduction, the summary sections that are added to Chapters 2 through 7 and the concluding chapter. Those who want to familiarize themselves with the general issues of health-care financing in less developed countries should read Chapter 2 and, for more detail on health-care infrastructure, Chapter 3. Those two chapters could be skipped by readers who are thoroughly familiar with the health-care systems in the developing world and their financing problems.

Chapter 4 is a non-technical chapter introducing some concepts of welfare economics, as they relate to health-care. This chapter is added to help non-economists to follow the analysis presented in subsequent chapters.

Chapter 5 contains the main theoretical part of this study. It is rather technical, but it is a must for those readers who want to scrutinize the theoretical base of our empirical work. The latter is presented in Chapter 6, which is perhaps the most important chapter.

Readers not interested in the details of the theoretical and empirical work, could make do with reading just the summaries of Chapter 5 and 6 and turning immediately to the policy implications of our findings, which are presented in Chapter 7. This chapter and the concluding one are recommended to anyone who took the trouble of picking up this book.

CHAPTER 1

Introduction

This study is about money. Money to pay for delivering health services in developing countries. It is motivated by the general observation that the health status of the population in less developed countries (LDCs) is well below that in the industrialized world, and that the distribution as well as the quality of health-care in LDCs leave much to be desired. It is well-known that the general lack of resources for health-care services in LDCs is a major cause of this sad state of affairs.

The first chapters of this book show how important health-care is in the development process. We give arguments for the heavy government involvement in the provision of medical care, both in developed and developing countries, and illustrate the shortcomings of the health-care infrastructure in LDCs. The latter is based on detailed information on two countries: Côte d'Ivoire and Peru. In subsequent chapters these countries are used as case studies for the specific, and relatively narrow question we will try to answer: are user fees for medical care a desirable and feasible alternative to government financing?

Throughout the developing world governments provide the bulk of resources for the health-care system. Subsidies for medical education, capital for government hospitals, subsidized drugs and free clinic and hospital services are the rule, not the exception. In this, LDCs do not differ much from industrialized countries where government intervention in the health-care sector ranges from subsidies for selected groups of the population

(e.g. the aged), via general public health insurance schemes, to complete public health-care provider systems in which the government provides medical care free of charge to the entire population.

The main difference between the developed and the developing world is that in the latter resources are much more scarce. Though many other problems can be pointed at - inefficient use of available resources, bias towards the provision of curative rather than preventive care, preferential treatment of politically powerful constituencies - the overall picture is that of a general lack of resources. This picture has become worse during the global recession of the eighties. Oil shocks in the late seventies, combined with tight monetary and fiscal policies in the major industrialized countries, triggered this recession. Oil-importing developing countries were particularly hard hit, but many other LDCs suffered from low prices for their commodity exports, and from low demand for their products in general. The developing world resorted to heavy borrowing which, combined with the sharp increase in interest rates, sky rocketed their debt service costs. For example, Cline (1985) reports that in 1973-77 15.4 percent of export earnings were used to service the debt. In 1985 many countries in Africa and Latin America spent 30 to 55 percent of their export earnings for servicing the debts (e.g. Kakwani, 1988).

Faced with unattainable unbalances in their economy, developing countries started so-called adjusted programs, under the auspicious of the International Monetary Fund and the World Bank. A typical structural adjustment package includes tight fiscal and monetary restraints, and usually results in a significant fall in domestic output, real wages and private consumption levels. Some have argued (e.g. Cornia, et al., 1987) that such

austerity measures have put an unexceptable burden on the poor in these countries, especially through cuts in social sector spending (food subsidies, health-care, education). Few, though, question the necessity of stabilization and adjustment measures for countries with unsustainable unbalances in their economy.

It is well beyond the scope of this study to discuss the pro's and con's of the macro-economic policies that are currently being promoted by the international development community. The importance of the current macro-economic situation in LDCs lies in the recognition that resources are severely constraint, that a return to sustainable economic growth appears to take more time than initially expected, and that fiscal constraint is a major element of the policies put in place to promote such growth.

The latter has an immediate bearing on our study. If the health-care systems in LDCs suffer from lack of resources, and if one can no longer depend on increased government expenditure, where can we find the necessary resources to improve the health-care structure? The common answer to this question is to introduce (or increase) user fees in the system, i.e. let the consumer/patient pay a larger share of the cost.

The feasibility of such a solution depends heavily on the price sensitivity of the demand for medical care. There are two issues here: First, how price elastic is the demand for medical care in general? Clearly, if small changes in the price result in large reductions in utilization, the amount of extra revenues raised will be small, too small perhaps to justify the policy. Secondly, is the demand for medical care for some groups in the population more/less price sensitive than for others? For instance, if the poor, or the aged, or women or children are more price-sensitive than, say,

relatively well-to-do prime aged males, a user fee policy may have distributional consequences that are socially or politically undesirable.

The main part of this study is devoted to answering these two questions. We will answer these questions by analyzing the health-care provider choice of households in rural communities in two developing countries. The answers to these questions are simple: yes, the demand for medical care is price sensitive, but not so that it prevents user fees from being a viable option for resource mobilization. An yes, the poor as well as children will be hurt more by the introduction of user fees than the population in general.

These empirical results are presented in Chapter 6. Their policy implications are demonstrated in Chapter 7, where we simulate the consequences of alternative pricing policies. These consequences are evaluated using three criteria: effects on health care utilization (including the distributional aspects), the potential for revenue raising, and the economic welfare effect on the population.

These two chapters form the core of the empirical study. The rest of the book is devoted to defining the problem and developing a theoretical framework for the analysis. In Chapter 2 we illustrate the importance of health in the development process. In this chapter we also provide and evaluate the main arguments that are usually put forward to justify the heavy government involvement in the health-care system. Chapter 3 provides background information on health and medical care on two continents: Africa and Latin America, with emphasis on Côte d'Ivoire and Peru. Chapters 4 and 5 provide the analytical and theoretical underpinnings of our subsequent empirical work.

In the concluding chapter we rejoin the debate for and against user fees for medical care. We also discuss some of the caveats of our study and provide, inter alia, an agenda for future research. In the final section of that chapter we give suggestions on how, armed with the new empirical evidence, user fees can be introduced in the health-care system in a way that puts a heavy emphasis on the need to protect the poor against the adverse effects of user fees policies.

CHAPTER 2

Health, Health-Care And Development

The health status of the population is one of the most important factors in the economic development process for at least two reasons. First, as an indicator of economic development, it shows the success or failure of a country to provide for the most basic needs of its people (food, save sanitary conditions, shelter, etc). Secondly, health - a form of human capital - is an input in the further development of a country. Health influences the labor supply and productivity of adults and the school enrollment and school performance of children. Furthermore, high infant and child mortality rates are among the most important factors related to high fertility rates which, in turn, play a crucial role in development. (See, among others, Krueger, 1968; World Bank; 1980, Wheeler, 1980, Hicks, 1980 and Balassa, 1985 for a discussion of the roel of human capital in economic development).

As a stylized fact, the correlation between crude health indicators such as child mortality and life expectancy, on the one hand, and per capita income on the other is well documented (e.g. Preston, 1980; Golladay, and Liese, 1980; World Bank, 1980). Another important stylized fact is the correlation between expenditures for medical care and per capita income. Indeed, as we will show in Section 2, this correlation is so strong that, especially for poor countries, knowledge of a country's per capita income suffices to obtain a fairly accurate prediction of its per capita expenditures for medical goods and services.

Given that medical care directly aims at improving the health status of the population and given the correlations between health and economic development and between development and health-care expenditures, one would perhaps expect a somewhat stronger relationship between health status and medical care expenditures than is usually found. We turn to this relationship in Section 3. Our aim is not to develop a model that shows the causal relationships between the three variables of interest: health, health-care and development. Rather, by showing the correlations, we want to highlight one set of reasons why the health status of a population is of such primary concern to policy makers in the developing world as well as in industrialized countries. This concern is frequently manifested in heavy government involvement in the health-care sector, ranging anywhere from the provision of public health-care insurance for selected population groups, to the constitutional right of every citizen to have access to free medical care.

In Section 4 we discuss another set of issues that help explain why in most countries the government is heavily involved in the provision of medical care. Although in many aspects health-care is a "normal" good, with positive income and negative price elasticities, certain aspects of health and medical care make it less desirable to leave the provision of medical goods and services to market forces alone. This does not necessarily mean that government intervention is the appropriate panacea. But, at the very least, it provides an additional explanation for the involvement of governments in the health-care sector.

In the last section of this chapter we turn to the merits and potential hazards of government intervention in the market for medical goods and services. We discuss in general terms the various forms of intervention,

especially as they relate to issues of health-care financing. We also acknowledge the financial and structural constraints that governments must face. Thus, we will present the background for the more detailed and country specific discussion of the organization of health-care markets and their financing mechanisms, presented in Chapter 3. But first we will present a simple descriptive analysis based on aggregated data from 34 countries referring to the year 1975.

2.1. Health and Development

There is a strong positive correlation between health and development. This is demonstrated in Figure 1 where we plot four health indicators against per capita Gross National Product (GNP). The indicators are life expectancy at birth, infant and child mortality rates and the crude death rate, (obtained from the Social Indicators database, World Bank, 1986). The countries chosen are the same as those included in Kravis et al. (1982) and represent all stages of development.[1/] The countries are listed in Table 1 in ascending order of per capita GNP. The lines drawn through the scatter diagrams represent double-logarithmic regressions. The regression results are presented in Table 2.

1/ The Kravis data include information on health-care expenditures. The expenditure data are adjusted so as to be fully comparable across countries. We will use these data in Section 2.2.

Table 1. Gross National Product Per Capita; Selected Countries 1975 [1/]

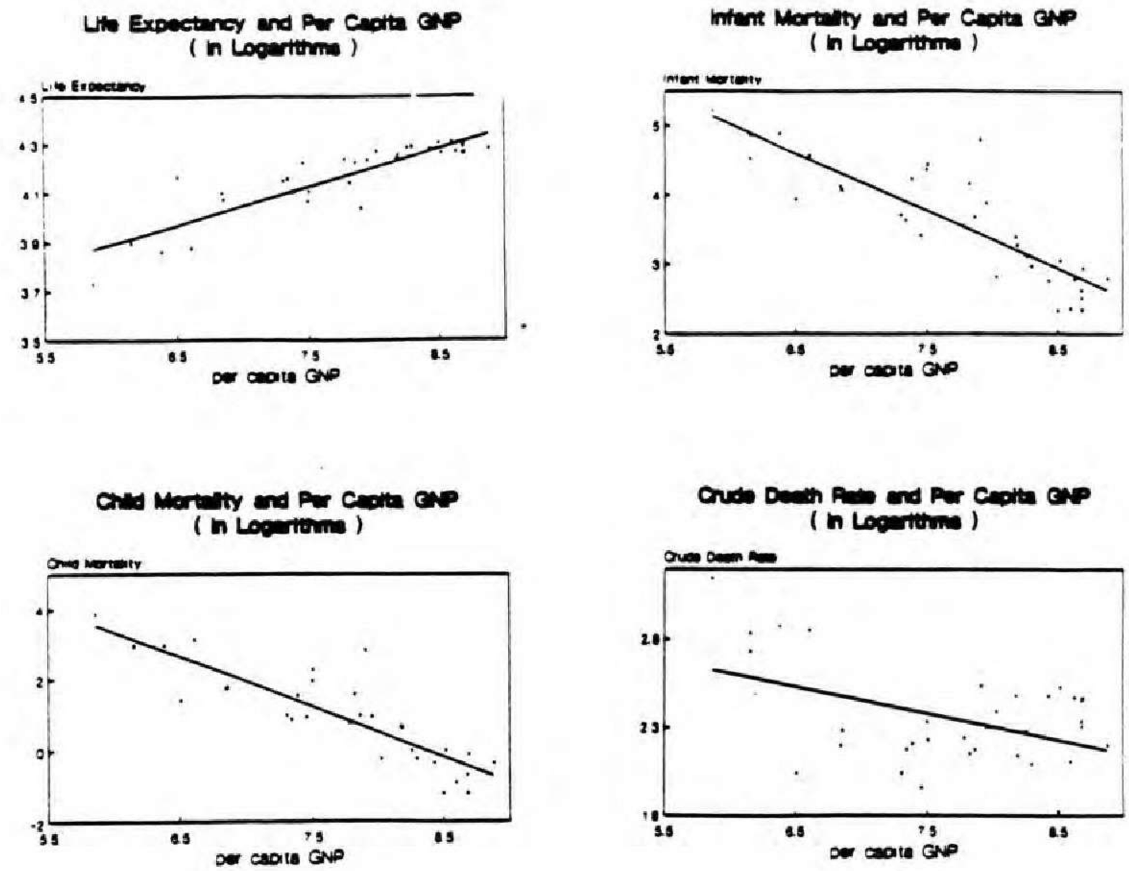
1. Malawi	$ 351	18. Iran	$ 2704
2. Kenya	470	19. Uruguay	2844
3. India	470	20. Ireland	3048
4. Pakistan	590	21. Hungary	3558
5. Sri Lanka	667	22. Poland	3597
6. Zambia	737	23. Italy	3861
7. Thailand	936	24. Spain	4010
8. Philippines	996	25. United Kingdom	4587
9. Korea	1484	26. Japan	4906
10. Malaysia	1540	27. Austria	4994
11. Colombia	1608	28. Netherlands	5397
12. Jamaica	1722	29. Belgium	5574
13. Syria	1794	30. France	5876
14. Brazil	1811	31. Luxembourg	5883
15. Romania	2386	32. Denmark	5910
16. Mexico	2487	33. Germany	5952
17. Yugoslavia	2591	34. USA	7176

1/ Source, Kravis (1982); all data are 1975 US dollars.

These familiar diagrams demonstrate the wide range of health status across countries. Life expectancy at birth ranges from 41.7 years in Malawi to 74.6 years in The Netherlands. Infant death rates range from 10.3 to 184.0 per thousand and the crude death rate ranges from 6.2 in to 23.3.

The diagrams also show the very strong correlation between health and income levels. The associated regression coefficients in Table 2 are all significantly different from zero at a better than 1 percent confidence level and the adjusted R-squares show that, except for the crude death rate, per capita income is a fairly good predictor of health status. The regression results suggest that a 10 percent increase in per capita GNP corresponds roughly with an increase of 1 year in life expectancy, an 8.3 percent

FIGURE 1: Health Indicators and GNP (1975)



reduction in the infant mortality rate, a 14.2 percent reduction in the child mortality rate, and a 1.5 percent reduction in the crude death rate.

Table 2. **Regression Results[1]: Health and Development**
(T-Values in Parenthesis)

	Life Expectancy	Infant Mortality	Child Mortality	Crude Death Rate
Constant	2.951 (26.84)	10.024 (14.96)	11.851 (11.52)	3.510 (8.75)
GNP, Per Capita	.157 (11.09)	-.833 (9.65)	-1.415 (10.68)	-.151 (2.91)
$\bar{R}^2$	.787	.737	.774	.185

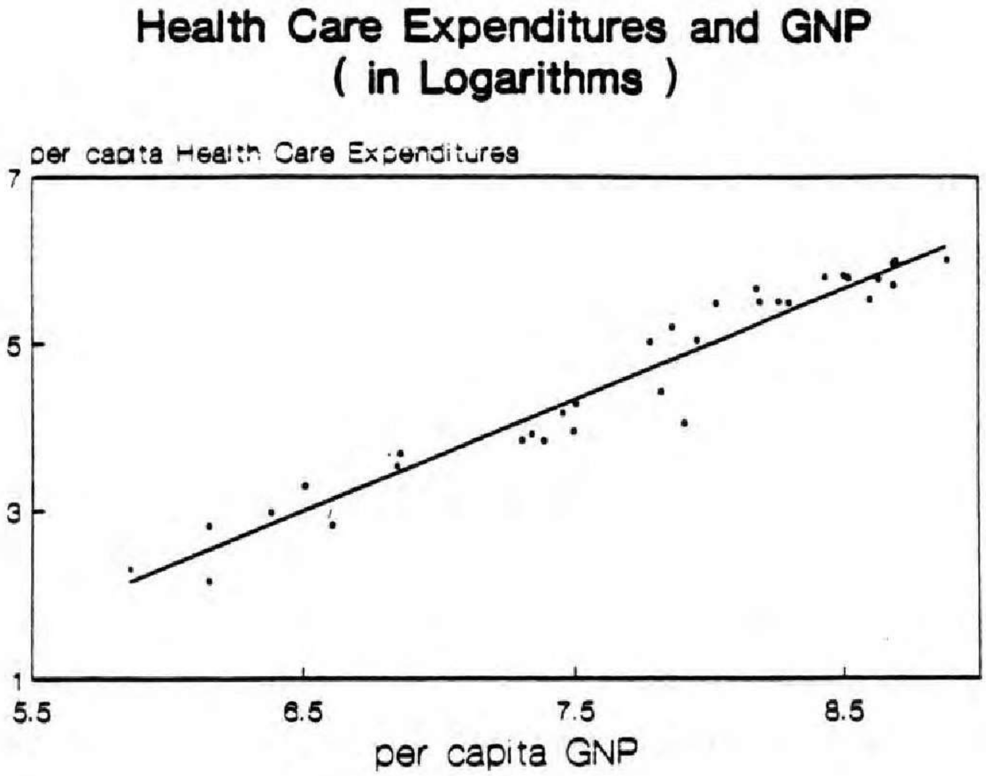
1/ Variables measured in logarithm.

2.2 Development and Health-Care Consumption

Of course, income *per se* does not produce good health. There is ample evidence, both from micro and macro studies, that income is a proxy for improved nutritional status, safer sanitary conditions, better housing conditions, higher education levels, etc. All of these factors contribute, directly or indirectly, to an improvement in overall health status. The most direct intervention that aims at improving health is the provision of medical goods and services.

Figure 2 shows the relationship between per capita health-care expenditures and per capita GNP. Per capita expenditures in this sample of countries range from US$ 8.70 in Kenya to US$ 401.29 in U.S.A. The double-logarithmic Engel curve drawn through the scatter diagram has a R-squared of .942 and indicates that medical care is a luxury good: the income elasticity of total health-care expenditures is 1.329 (see Table 3 below). This perhaps somewhat surprising finding is not new. Musgrove (1978) reports income elasticities about ranging form .81 to 1.34, using household income and expenditure data from ten South America cities. In a subsequent study (Musgrove, 1983), he again concludes that health-care is a luxury good (i.e. the income elasticity exceeds 1.0). Newhouse (1977) using a data set similar to ours, but for developed countries only, obtained income elasticities in the range from 1.13 to 1.31. The persistently high correlation between health-care expenditures and per capita income shows that despite a large variety of efforts "to keep health-care costs down," as evidenced by the large variety of health-care systems, insurance schemes, and other financing mechanisms we find throughout the world, in the end countries consume an amount of medical care that is determined mainly by their level of income.

FIGURE 2:


Health Care Expenditures and GNP
(in Logarithms)
per capita Health Care Expenditures
7
5
3
1
5.5
6.5
7.5
8.5
per capita GNP

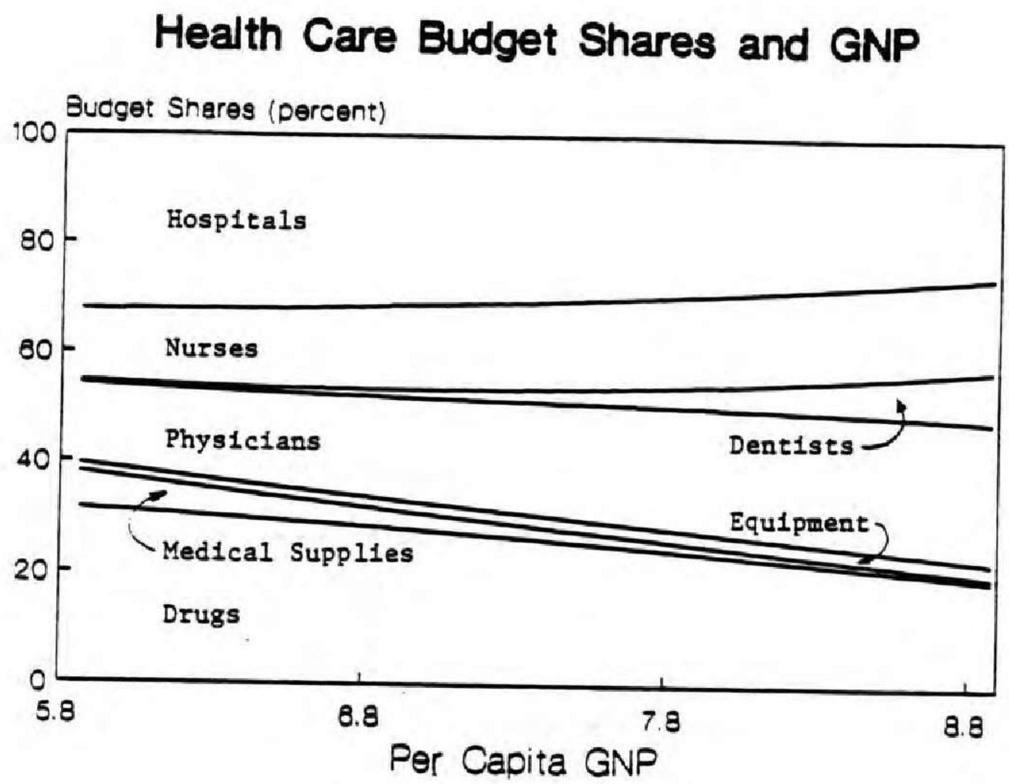
This conclusion foreshadows one of the main issues of the book: how to maintain, and indeed improve a health-care system in the light of constant or contracting resources? As we argue later on, many developing countries face declining per capita GNP's, increasing demands for medical care due to demographic and socio-economic trends, severe budgetary problems and a prolonged contraction of private consumption. Furthermore, their health-care systems already leave much to be desired: hospitals without equipment, doctors without drugs, and rural clinics without safe drinking water or electricity are often the rule rather than the exception. In periods of sustained economic growth, one may expect a more than proportional improvement of the health-care system (at least in terms of expenditures), given the apparently high income elasticity of medical care. But the same result implies that special attention needs to be given to the health-care system in times of economic recession or - at best - zero economic growth (see also World Health Organization, 1987a and 1987b). Where can we find the resources to maintain the current system? How can we generate additional resources to make the necessary improvements? These are the central questions that motivate this study.

Table 3 shows summary statistics and Engel curves (in logarithmic form) for detailed per capita health-care expenditures. Hospitals and physician services form the bigger share, but drugs and nurses also command a sizeable proportion of the total health care budget. With the exception of medical supplies, all items are luxuries in the economic sense: for the luxury items, income elasticities range from 1.361 for hospitals to 2.409 for dental services. The overall income elasticity is 1.329. The variation in

Table 3. **A. rage Per Capita Expenditures on Health Care and Regression Results: Health Care Expenditures on GNP** (In Logarithms) (T-Values in Parenthesis)

	Per Capita Expenditures			Regression Results				
	Average	Standard Error	Percentage	Constant		Coefficient on GNP ..r capita		$\bar{R}^2$
Drugs & Med. Prep.	34.74	45.08	20.7	-5.791	(7.74)	1.276	(11.29)	.793
Medical Supplies	4.27	10.34	2.5	-4.924	(2.72)	.691	(2.97)	.191
Therapeutic Equip.	4.81	7.19	2.9	-11.798	(5.476)	1.613	(5.81)	.499
Physician Services	37.64	49.17	22.4	-9.618	(11.26)	1.627	(14.79)	.868
Dental Services	9.25	13.36	5.5	-17.564	(11.29)	2.409	(12.02)	.813
Nursing Services	28.27	39.23	16.8	-9.084	(10.17)	1.519	(13.20)	.840
Hospitals	49.25	65.73	29.3	-7.272	(6.61)	1.361	(9.61)	.735
Total	168.23	215.81	100%	-5.640	(12.45)	1.3289	(22.77)	.940

FIGURE 3


Health Care Budget Shares and GNP
Budget Shares (percent)
100
80
60
40
20
0
Hospitals
Nurses
Physicians
Dentists
Equipment
Medical Supplies
Drugs
5.8
6.8
7.8
8.8
Per Capita GNP

elasticities implies that the shares within the health-care budget will change with development. We show this in Figure 3 for an average country.

2.3. Health Production Functions

As we have seen above, income is a pretty good predictor for a nation's health status as measured by such crude indicators as mortality rates and life expectancy. Behind this observation lies a large and complex set of factors that, at the micro level, influences individual health status. Aggregated over all individuals one can imagine a health production function that summarizes the complex causal chains that have an impact on individual health. In this section we will estimate the simplest of such an aggregated reduced-form health production function. The nature of the data available prevent us from formulating a convincing structural model that shows how nations, through a rational use of their scarce resources, are able to increase the health of their population and how, in turn, this improved health contributes to further economic development. Our goal is much less pretentious and is in the same spirit as the descriptive analyses of the previous two sections. We want to investigate whether the more than proportional increase in health-care expenditures that accompanies economic growth, contributes to the health of the population, while taking the effects of some other factors into account.

Factors, other than medical care, that come immediately to mind as being relevant to a population's health status are education, overall consumption levels and general living conditions. As a proxy measure for education we use the country's illiteracy rate. We expect private consumption

levels to be of importance especially with regard to food consumption. Average calory intake is used as a proxy for food consumption. The overall living conditions refer to such amenities as access to public services, save drinking water, safe sewerage systems, etc. Though far from being an ideal measure, we will use the population density to represent these factors. The health measures used are the same as those introduced in Section 2, while the consumption of medical goods and services is represented by per capita health-care expenditures (from Section 3). The health production functions are estimated in double logarithmic form. Estimation results are presented in Table 4.

Table 4. **Health-care Production Functions** (T-Values in parenthesis)

	Life Expectancy	Infant Mortality	Child Mortality	Crude Death Rate
Constant	3.110 (5.22)	10.251 (1.80)	4.752 (.57)	.454 (.15)
Literacy	.191 (7.06)	-.400 (1.54)	-.708 (1.88)	-.658 (4.84)
Pop. Density	.009 (1.38)	-.169 (2.54)	-.238 (2.46)	-.007 (.19)
Cal. intake	-.013 (.16)	-.289 (.38)	.538 (.49)	.608 (1.54)
Health exp. Per Capita	.062 (3.56)	-.412 (2.48)	-.868 (3.60)	-.014 (.16)
$\bar{R}^2$	.941	.819	.862	.571

Perhaps the most surprising result of this simple exercise is that literacy stands out as a very important factor related to the production of health. Many studies based on micro data have shown that, for instance, parental education is an important determinant of child health status (Behrman and Wolfe, 1987a and 1987b; Strauss, 1987). Evidence from aggregated data is more scarce, but Cochrane, O'Hara and Leslie (1980) also report strong correlations between adult literacy and child health measures.

If one accepts the population density as an appropriate proxy for overall living conditions, the results show that infant and child mortality rates will fall when these conditions improve. Calory intake does not show any significant effect on health. Most likely, the distribution of food consumption, e.g. calories consumed by the poorest 20 percent of the population, is more relevant to health than the average calorie intake (see, for instance, Behrman and Deolakikar, 1987). The use of national averages obscures the relation between health and nutritional status that has been demonstrated in studies using micro data.

The most important result is the effect of health-care expenditures on health. The estimation results indicate that for a 10 percent increase in health-care expenditures one can "buy" an increase of 0.4 years in life expectancy, a 4.1 percent reduction in the infant mortality rate (from 50.7 to 48.6 on average), and an 8.7 percent reduction in the child death rate (from 6.35 to 5.8). Note that a 10 percent increase in expenditures corresponds to US$1.00 for the poorest country in this sample and to US$16.82 on average. As before, these results imply that special attention needs to be given to the health-care system in times of economic austerity. Just as sustained economic growth can be expected to lead, <u>ceteris paribus</u>, to improved health, so is a

decline in per capita income likely to result in a deterioration of the health-care system and a subsequent reduction in health status.[2/]

Despite the plausibility of these results, we would like to warn the reader not to take these estimates as proof that under all circumstances an increase/decrease in health-care expenditures will result in an improvement/reduction of the population's health status. The causal chain that produces good health is a complex one that cannot be adequately analyzed on the basis of aggregated data. However, though health-care expenditures can be wasteful or even counter productive, in general there does exist a direct causal relationship from health-care consumption to improved health. Moreover, our results correspond to those based on studies that mostly using micro data, aim at showing the causal relationships that run from income, education and the use of health services to improved health.

2.4. Government Intervention In The Health-Care Sector

The relationships between health, health-care utilization and development explain, at least in part, the political will of many governments to increase the consumption of medical care, e.g. through subsidies, or by providing health-care free of charge. The expected impact of such an increase in medical consumption, in terms of reduced suffering and an increase in health status (and, thus, productivity) provide a strong justification for interventions in the market for medical goods and services. Our results are

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2/ Cornia et al. (1987) who provided evidence about the deterioration of nutrition and health status (especially among children) during the first half of the 1980s.

consistent with the claim that such government efforts indeed result in a healthier population.

There are many other good reasons why governments should intervene in the provision of (certain types) of medical care. However, not all forms of medical care are equally effective in terms of improving the overall health level of the population. Furthermore, most types of market interventions come at a cost: be it in the form of reduced efficiency or, when the price mechanism is being replaced by some other form of rationing, in terms of undesirable inequity effects. Finally, and perhaps most importantly, governments face budgetary constraints. Without due respect to such constraints, even the best intentions of governments are doomed to fail. It is often argued that the neglect of budgetary realities, combined with other negative side effects of government interventions in the health-care market, account for the dismal state of many health-care system in the developing world.

Still, as stated above, there are several good reasons why the provision of medical goods and services should not be left to market forces alone. First of all, it is well recognized that the consumption of medical care can generate externalities. The most obvious examples of health-care programs that generate large externalities include vaccination programs, sanitation programs, the provision of clean drinking water and medical research. Though not all externalities necessarily call for government interventions, some aspects of medical care, e.g. the control of contagious diseases, are best provided by the government.

Secondly, suffering from a spell of bad health is an uncertain event, making the need to spend on medical care unpredictable. Arrow, in his seminal

article on "Uncertainty and the Welfare Economics of Medical Care" (Arrow, 1963), stressed unpredictability of medical outlays, thus providing the formal argument for the economic (welfare enhancing) efficiency of implementing some form of health insurance. Often such insurance is provided by the government, either in the form of comprehensive public insurance schemes, by providing medical care at subsidized prices, or free of charge.

Finally, but maybe even more important than all previous arguments combined, good health is widely perceived as a basic human right. Financial or other barriers to obtaining medical care are thought to be unethical or at least socially undesirable. This belief has in some countries resulted in the constitutional right for all citizens to obtain medical care fee of charge. In other countries governments have taken the role of the sole provider of medical care, usually with accompanying public insurance schemes. The belief that health is a basic human right also underlies the declaration of Alma Ata that aims at Health for All in the year 2000.

Whatever the motives, the subsequent policy measures all result in a reduction for the consumer of the price of medical care. This price reduction, has lead to two wide-spread phenomena that, in turn, have given rise to more government intervention: moral hazard and supplier-induced demand. Since any type of insurance lowers the price of the insured good to the consumer, at least at the time that the transaction takes place, the consumer has a incentive to buy more of the good than he or she otherwise would (if the good were price elastic). This phenomenon is referred to in the insurance literature as moral hazard and is sometimes said to contribute to the alleged over-utilization of some types of medical care. Regulations to counter this undesirable side-effect of health insurance include compulsory

consulta ns with general practitioners prior to obtaining more expensive speciali c or hospital care.

Supplier-induced demand refers to the possibility that physicians partly pursue their own interests when prescribing treatment for their patients. Since the fully insured patient has no incentive to search for the most cost-effective treatment, and indeed may perceive the most expensive treatment as the best one, the physician may prescribe and deliver the treatment that is most profitable for him. The literature on supplier-induced demand is quite extensive, though far from conclusive (e.g. Phelps, 1986). Measures to reduce the demand increasing effects include compulsory second opinions for major operations and innovative insurance schemes that include incentives for the physician to search for cost effective treatments. (see the extensive literature on Health Maintenance Organizations, HMO's, e.g. Welch, 1985).

The supplier-induced demand hypothesis is closely related to alleged consumer-ignorance in the health-care market. The patient suffering from a disease knows that he or she needs some form of medical care but is usually insufficiently informed to ask for a specific type and quantity drug or treatment. This consumer-ignorance has lead to a wide range of regulatory measures to protect the consumer. Health workers need to fulfill minimum requirements to obtain a license to practice, while medical education is generally provided by the government, or strongly regulated. Drugs can only be marketed after extensive safety testing and a large group of drugs can only be provided by licensed pharmacists.

2.5 Three Categories of Medical Care

In the previous section we showed that there are many special aspects of health and medical care (from sound economic arguments that call for insurance schemes to the ideological position that health is a basic human right) that provide compelling reasons for some form of government intervention in the health-care market. Indeed, the health-care system is among the most regulated industries in most countries in both the industrialized and the developing world. All interventions will, directly or indirectly, alter the price of the good or service faced by the consumer. For instance, market entrance restrictions such as licensing are likely to raise the price of medical care. Most other interventions, however, aim at reducing the price, either through direct subsidies or public health insurance schemes or, in the extreme, the public provision of free medical care. These price reductions will, at least in principle, increase the consumption of medical care and, consequently, improve the health status of the population. Given the importance of health as a public good and as an important in development, this seems a good thing, but it is important to realize that health-care is not a homogeneous commodity. It includes drugs, physician services, hospital and nursing home care, as well as immunization campaigns, sanitation services and health education programs such as advertising the benefits of regular exercises, warnings against the hazards of smoking, and guidelines for food preparation and education on the importance of boiling potentially unsafe drinking water. In the context of discussing the governments role in health-care financing it is useful to present the categorization of health-care provided by De Ferranti (1985). He distinguishes between curative care,

preventive care that is patient related and preventive care that is not patient related. The following table is taken from his study and briefly describes each of these three categories.

The strongest case for providing health-care services free of charge is for the category of non-patient-related preventive services. The argument is a very practical one: since no direct transaction takes place between the supplier of the service (e.g. pest control) and any particular clients, charging individuals who benefit from the service is simply not feasible. If a fee were charged there would be no way of limiting the benefits to those who choose to pay. This non-exclusivity argument implies that some public agent should provide such services, while the costs are covered from general revenues (taxes).

There is, in principle, no problem for charging the cost of medical care to the patient for the second category of health-care services: patient related preventive care. The child being immunized or the mother receiving pre- or antenatal care are readily identified. Still we usually find such services being provided free of charge or well below actual costs. There are two main arguments for this. First, there are externalities to certain types of preventive services that warrant subsidization. The case of contagious disease is the most obvious example. Another focus of preventive measures may be to reduce disabilities that otherwise result in large incidence of support cases to be borne by the community. (e.g. antenatal care to prevent low birth weight that may result in physical or mental handicaps). In such cases also, some form of subsidization can be defended on economic grounds.

TABLE 5. **CATEGORIES OF MEDICAL CARE**

I. **Curative Care**

Includes personal services (care of patients) by health facilities and independent providers, including traditional practitioners; and purchases by users of medicines. Can be subdivided into:

(i) "first-contact" services (all outpatient)

(ii) referral services (inpatient and some outpatient)

II. **Preventive care: patient-related**

Includes services to well patients, particularly infants, mothers, and pregnant women; also oral rehydration therapy and hypertension control. Delivered through maternal and child health clinics at health facilities and community health programs. Typical services are: immunization, growth monitoring, and instruction on improved breastfeeding and weaning practices.

III. **Preventive care: non-patient-related**

Includes disease control (both vector control and mass campaigns), sanitation, education and promotion of health and hygiene, control of pests and zoonotic diseases, and monitoring of disease patterns.

Source: De Ferranti, 1985, p.67.

The second argument for subsidization of this second category of health services has to do with the fact that the population may not be fully aware of the benefits of the preventive care while society as a whole ("the government") perceives such services to be of major social value. Preventive care is thus thought of as a merit good and measures are taken to increase consumption, e.g. through information campaigns and subsidies, by providing the good free of charge, or even by rewarding those who decide to consume such goods.

The case for subsidizing curative care is by far the weakest. The client is clearly identified and all benefits accrue to him or her. The overriding argument for subsidizing curative care that directly benefits the private consumer has to be the "basic right" argument. It is perceived to be socially desirable that those in need receive medical care and should not have to face financial or other barriers to access to the health care system. Policies to provide medical care to those in ill health, independent of the financial consequences, have taken many forms. In the industrialized world, some governments have sponsored programs for certain target groups (e.g. in the U.S., Medicaid for the poor and Medicare for the aged). Others have public insurance schemes that cover virtually the entire population (e.g. in The Netherlands and Germany) or have nationalized health-care systems (e.g. England, Canada). Similar systems can be found in third world countries but the dominant way of reducing the financial barrier to obtaining medical care is by direct subsidization, up to the point where health-care is provided free-of-charge.

2.6 The Role of Prices in the Health-Care Market

Of course, there is no such thing as "free" medical care. The cost has to be borne by somebody. This cost has two aspects: the cost of providing medical care and the cost of obtaining care. The latter is borne by the consumer and includes not only the fee charged, but also the (opportunity cost of the) time used to travel to the health-care facility, the cost of such travel, the waiting time, etc. Thus, even when the fee is zero, the private cost is positive (and, as we shall see later, can be quite large).

The cost of providing medical care is the sum of all the inputs: wages and salaries of the health workers, equipment drugs, hospital maintenance, etc. If medical care is financed (mostly) out of general revenues, the health-care sector has to compete with other sectors for the scarce government resources. Thus, in the aggregate, the health sector faces a budget constraint and some form of rationing has to take place, even if medical care is provided free of charge.

The many problems facing health-care systems in the developing world (and in many industrialized countries) can to a large extent be traced back by the virtual elimination of price signals in the medical market. On the supply side, investments in both human and non-human capital are no longer guided by relative prices and expected benefits. Rather they are influenced by government subsidies for medical education or stem directly from centrally planned health-care programs. Such programs often show a bias towards high-tech curative care, at the cost of low-cost primary care and preventive measures.

On the demand side consumers no longer face a financial barrier to obtaining medical care, but - given that overall resources are limited - other rationing mechanisms have taken over the place of the price - mechanism. This raises the question of how successful governments have been to increase access to medical care by subsidizing or providing the goods and services free of charge. Who receives the care? How much? How does the rationing take place in the absence of the price mechanism?

A recent World Bank Policy Study analyzed the effect of current financing mechanisms for medical care and points at the internal inefficiency of the health-care sector, as well as at the consequences on the demand side (World Bank, 1987). The conclusion on the latter is that governments have not been successful in providing care to those who need it. The better-off in most countries benefit more from the free or subsidized services than the poor. Rural areas in particular are badly served by public health-care facilities.

This again leads us to the main theme of this book: if the heavy subsidization of medical care in developing countries has not had the desired effect of providing access to those in need, what is the alternative? If governments do not have enough resources to provide adequate medical care to the population, where can additional resources be found? The frequent answer to this and indeed the answer that the World Bank's policy study proposes, is the introduction of user fees back into the system. Of course, the argument against user fees, i.e. they are a potential barrier to access of medical care, is exactly the reason why subsidies or free medical care were instituted in the first place. Thus before such a policy can be implemented a number of questions need to be answered, such as: for which services should fees be

charged; how high should charges be; are patients, especially the poor, willing to pay these charges and how much revenues can be raised? The answers to these questions depend crucially upon the responses of consumers to changes in the price of medical care. Is medical care price elastic? Do patients consider the price of medical care if they are ill? Will patients still use government health-services if a fee is changed? Are the poor more price sensitive than the better-off? What is the price elasticity of medical care?

Surprisingly enough, there is little empirical evidence upon which to base the answer to these questions, especially as they refer to the developing world. This study aims at filling this gap. First, in the next chapter, we will present a descriptive analyses of the health-care infrastructure, health-care financing and health-care utilization patterns in two countries, Peru and Côte d'Ivoire. We will demonstrate that, despite the governments' best intentions (e.g. in Peru, the population has the constitutional right to obtain free medical care from the government), major parts of the population do not have access to modern medical care. Rationing of the limited health-services available takes place not through the price mechanism, but through geographical distribution and queuing.

In the subsequent chapters we explore this issue of non-price rationing to formally define and measure willingness-to-pay for medical care. We will estimate income and price elasticities for medical care and provide answers to the main questions listed above, including those about the effects of user fees on the poor, and the potential for raising revenues. But first we will briefly summarize this chapter.

2.7 Summary

In this chapter we presented two broad reasons for the large role that governments play in the provision of medical care. The first is the strong correlation between development and health. The second set of reasons stem from certain characteristics of both health and medical care. For instance, viewing health as a basic human right explains why one does not want the market mechanism to be the only factor in the provision of medical care. Some of the characteristics of medical care (uncertainty of when and how much is needed, consumer ignorance, externalities, etc.), provide their own justifications for some form of government intervention or financing. Reducing the cost of medical care to the consumer puts the burden of financing care on the government. The severe budgetary constraints faced by many governments in LDCs have caused the results of government policies in the health-care sector to fall far short of expectations.

Medical care takes many forms and the economic arguments for government financing or subsidization are stronger for those types of medical care that are preventive in character than for curative care. Even for some types of preventive care, i.e. those types that directly benefit the specific client, the benefits of subsidization may not always exceed the economic costs. The case for subsidizing curative care, or providing curative care free of charge, is the weakest, at least on economic grounds. However, when good health and access to medical care are considered basic rights, the social benefits of providing medical care free of charge or at highly subsidized prices may well exceed the economic costs, provided, of course, that such policies indeed succeed in eliminating the access barriers to medical care.

In the next chapter we will investigate to what extent the provision of medical care at (close to) zero costs has succeeded in providing adequate medical care to those who need it, independent of their economic means. With this equity objective in mind, we will take a close look at the health-care sectors of Côte d'Ivoire, where medical care is provided free of charge, and of Peru, where we find a variety of health insurance schemes as well as large government subsidies for most types of medical care.

CHAPTER 3

The Health-Care Systems in Côte d'Ivoire and Peru

In the following chapters we will provide a detailed analysis of the demand for medical care in two countries. One in Africa, Côte d'Ivoire, and one in Latin America, Peru. This chapter will present socio-economic information that can serve as background for the subsequent empirical studies. Starting with Africa, we will present some key economic and health indicators and discuss the general organization of the Ivorian health-care system. The second half of this chapter provides the information for Peru.

3.1 Health and Health-Care in West Africa

Côte d'Ivoire is part of the West Africa region that is situated along the coast of the Atlantic Ocean. Liberia and Ghana are its neighbors on the west and east border, respectively, while Guinea-Bissau, Mali and Burkina Faso border the country in the north. Côte d'Ivoire has about 10 million inhabitants of which more than 60 percent live in rural areas.

This West-African region has some of the poorest countries in the world. Benin, Burkina Faso and Guinea-Bissau, to name just a few, all have per capita incomes of well below $300 per year. Health indicators for this region reflect this poverty. Life expectancies as low as 38.4 years are reported by Guinea, Guinea-Bissau and Sierra Leone (Table 1). Infant mortality rates exceed 150 per thousand for many of the countries in this region, and are as high as 175 in some countries. Child death rates range from 7.3 in the Cango to 43.5 in Guinea, Mali and Sierra Leone.

Other indicators sketch an equally bleak picture: For instance, most of the countries in this region do not produce enough food to match the daily

calorie intake requirements of the population. Primary school enrollment in six out of the 18 countries listed is well below 50% and the vast majority of the people have no access to clean drinking water.

The last three columns of this Table show basic indicators of the health service infrastructure of these countries. Perhaps the most striking fact here is that so little is known. For one third of the countries such simple measures as the population/physician ratio are not available. The data that are available show a large variation, part of which is likely to be the result of differences in definition. In those low income sub-Saharan countries for which there are data we find just over one doctor for every 40 thousand people, one nurse for every 3300 people and one hospital bed to serve 1700 people. For middle income sub-Saharan countries the numbers are somewhat better, especially with regard to physicians.

Though generalizations have a tendency to obscure rather than to enlighten facts, it seems fair to say that the health-care system in a typical country in West-Africa is badly developed. Indeed, the averages presented in Table 1 do not reveal some of the most serious deficiencies of the health-care systems, such as the skewed distribution of services in favor of urban areas and the poor quality of the services. This poor quality is evidenced by the lack of equipment in hospitals and the lack of drugs in clinics. In general the lack of a sound financial basis has dried up resources for anything but the salaries of the staff. (See Vogel, 1987, for a detailed description of health-care financing in four West-African countries; Senegal, Mali, Ghana and Côte d'Ivoire.)

In the next section we will take a closer look at the health-care system in one West-African country: Côte d'Ivoire.

TABLE 1: Socio-economic Indicators, West Africa; selected countries

	GNP per capita	Life exp. at birth	Infant Mortality Rate	Child Death Rate	% of Calory Require-ments	Primary School Enroll-ment	Access to Safe Drinking Water	Pop. per Physician (Thous.)	Pop. per Nurse (Thous.)	Pop. per Hospital (Thous.)
Gabon	4100	50.7	108.4	21.9	122.2	118.0	-	-	-	-
Congo	1140	56.9	77.8	7.3	109.2	-	25.0	-	-	-
Cameroon	800	54.5	92.0	10.4	87.5	108.0	-	-	-	-
Nigeria	730	49.6	110.4	21.4	85.7	-	-	12.0	3.0	1.6
Côte d'Ivoire	610	52.4	106.0	15.0	111.5	79.0	65.9	-	-	-
Liberia	470	49.9	128.0	23.2	102.5	76.0	-	9.4	3.2	-
Mauritania	450	46.2	133.0	25.2	97.5	37.0	84.0	-	-	-
Senegal	380	46.2	137.6	27.0	102.4	53.0	42.0	14.2	2.2	-
Ghana	350	52.9	94.8	11.3	65.9	79.0	47.0	39.2	3.3	1.7
Guinea	330	38.4	175.6	30.6	97.0	63.0	10.0	8.1	.8	.6
Sao Tome and Principle	330	64.1	60.9	-	96.8	-	80.0	2.8	.7	-
Cape Verde	320	64.1	70.2	12.6	88.9	131.0	50.0	6.3	1.0	.5
Sierra Leone	310	38.4	175.6	43.5	90.5	45.0	16.0	19.3	2.3	.9
Benin	270	49.0	116.0	18.6	82.9	67.0	20.0	17.0	1.7	1.0
Central African Rep.	260	48.6	138.0	27.2	90.6	77.0	-	23.1	2.1	.7
Togo	250	51.5	98.4	12.4	93.7	102.0	42.0	21.2	1.9	-
Guinea-Bissau	190	38.4	175.4	30.6	97.0	63.0	10.0	8.1	.8	.6
Niger	190	43.3	141.6	28.7	96.6	27.0	33.0	-	-	-
Burkina Faso	160	45.2	145.6	30.4	85.0	27.0	30.0	51.6	3.2	-
Mali	140	45.9	175.6	43.5	68.0	24.0	6.0	27.8	2.5	-
Reference Groups										
Low Income Sub-Saharan	219.9	48.2	128.5	25.7	90.0	60.1	25.2	39.2	3.3	1.7
Mid. Income Sub-Saharan	1025.3	51.0	103.2	17.6	94.2	98.5	45.8	11.3	2.6	1.4

Source: Social Indicators of Development, 1986; World Bank.

3.2 The Ivorian Health-Care System

Since independence (1960), the Côte d'Ivoire has seen a steady economic growth, from a level of $145 per capita in 1960 up to $1,207 in 1980, the high point of its economic development. This "miracle Ivorian" resulted from an energetic export-oriented economic policy that made Côte d'Ivoire the number of one world exporter of cocoa and number two in coffee (den Tuinder, 1978). The country's heavy reliance on these two export crops makes it vulnerable to large flunctuations in the commodity prices. After the boom in coffee and cocoa prices during the mid-seventies, the coffee price declined 31 percent and the price of cocoa 10 percent during 1977-78. The government tried to keep the economy in high gear by increasing public investment financed by heavy external borrowing.

The burgeoning external public debt made it clear that this policy could not be continued. A major financial recovery and structural adjustment program was initiated in 1981. Public investment was cut by 21 percent and in 1983 government current and capital expenditures were reduced by an additional 20 percent. The initial consequences for the economy were severe. Employment in the modern sector declined 31 percent between 1979 and 1984 (Newman and Lavy, 1987). Per capita private consumption declined about 35 percent in real terms during the same period. (Table 2)

Though the adjustment measures are beginning to have their intended effects, the short run outlook suggests at least a continued stagnation of the economy in terms of per capita GDP.

Against this background there is little room for major new government initiatives to improve the health-care infrastructure of the country. That

such an initiative is called for is evidenced by the current health status of the population and the status of the country's health-care infrastructure.

Table 2. **Macro Economic Indicators for Côte d'Ivoire**
Selected years, 1965-1984; (CFAF billion, 1984 constant prices)

	1965	1970	1975	1980	1981	1982	1983	1984
GDP	1059.4	1632.3	2225.2	3210.3	3248.1	3123.5	2991.0	2869.3
GDP, Per Capita (CFAx1000)	325.9	415.3	400.9	474.19	379.89	353.55	321.6	293.9
Government Expenditure	-	-	332.6	535.2	501.7	496.4	474.8	442.8
Government Expenditure as % of GNP	-		14.9	16.7	15.4	15.8	15.8	15.4

Since 1960, crude health indicators have improved significantly. The infant mortality rate decreased from 167 in 1960 to 119 in 1982, while life

Table 3. Health Indicators for Côte d'Ivoire and Lower Middle Income Countries (averages)

	Côte d'Ivoire		Lower Middle Income	
	1960	1980	1960	1980
Crude Death Rate	24	17	20	12
Infant Mortality Rate	167	119	114	89
Child Mortality Rate	40	23	28	13
Life Expectancy at Birth	39	47	45	56

SOURCE: The Côte d'Ivoire Country Economic Memorandum, the World Bank, 1986.

expectancy at birth increased from 39 to 47 years (Table 3). Still, these indicators are little better than those prevailing in neighboring West African countries which are much poorer, and they compare unfavorably to those of an "average" lower middle income country. Clearly, the development of health-care programs has lacked behind those in countries of similar levels of development.

Large differences of health status exist within the country. In Abidjan life expectancy was estimated at 56 years in 1979, compared with only 39 years in the rural Savanna regions, and 50 years in the urban Savanna regions. Child mortality rates in rural areas were twice as high as in Abidjan. Part of these differences is likely to be related to the unequal distribution of welfare in the Ivory Coast. Based on the value of total household consumption, only 3.3 percent of those in the lowest quintile live in Abidjan, while 45.7 percent of "the poor" live in the Savanna area (Table 4). Just 3.9 percent of "the rich" live in the Savanna, while 42.8 percent of them live in Abidjan. This large, urban-rural welfare gap is paralleled by the distribution of health care infrastructure.

Table 4. The Regional Distribution of Welfare in
Côte d'Ivoire Consumption Quintiles, Percentages of the Population

		QUINTILES				
	Total	1	2	3	4	5
Abidjan	18.8	[illegible].3	5.2	13.2	29.2	42.8
Other Cities	22.4	7.0	18.1	28.2	27.1	31.8
Rural East	24.7	35.2	35.4	22.5	19.9	10.6
Rural West	15.2	8.8	19.6	21.9	14.9	11.0
Rural Savanna	18.9	45.7	21.8	14.1	9.0	3.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

SOURCE: Glewwe (1987)

About 40 percent of the population in Côte d'Ivoire lives in urban areas. Abidjan alone accounts for a population of 1.6 million, or about 17 percent of the total of 9.3 million (1983). All major hospital facilities are in the cities. The two university hospitals (about 1300 beds in total) are situated in Abidjan, while the five regional hospitals (general hospitals with a capacity of about 275 beds) are found in the cities of Bouaké, Man, Daloa, Abengourou and Korogho. Together these hospital facilities account for 41 percent of all beds. Rural areas are served by small local hospitals, maternity and child care units, dispensaries and mobile health units.

The hospital sector employs 70 percent of all doctors, 45 percent of all midwives and over 50 percent of all nurses. About 60 percent of all doctors are based in Abidjan. The overall health manpower situation is unbalanced. In 1983 there were about 600 doctors, 2200 nurses and 1000 midwives, but virtually no skilled auxiliary workers. Given the current health manpower training system, the number of physicians will increase from

6.5 per 100,000 population in 1983 to 7.8 in 2000. The number of nurses per capita will increase from about 24.9 to 26.5. Thus, the already low nurse/doctor ratio of 3.8 will further decrease to about 3.4.

All health workers are paid by the government. Medical care is, in principle, provided free of charge, though some attempts are under way to introduce user fees for hospital care. However, only an estimated 3.1 percent of total health-care cost is currently covered by user fees (Vogel, 1987).

For 1984 the government health budget was 32.6 billion CFAF, or 6.8% of the total budget down from 7.5% five years earlier. More than 75 per cent of this budget is for personnel cost, about 8 percent for drugs and the rest for materials, equipment, maintenance and other operating cost. Manpower projections indicate that the total health budget will soon be insufficient just to cover personnel cost only, unless the health budget grows much faster than other parts of the government budget, or unless other financial resources are found.

The general quality of the existing facilities leaves much to be desired. A 1979 study showed that of the 309 dispensaries, one third was more than 20 years old, only 19 percent had piped in water and just 21 percent had a working water pump. Of the 126 Maternal-Child Health Care units (MCH), 45 percent had no water and 31 percent no electricity. The two university hospitals in Abidjan have occupancy rates well in excess of 100 percent, but many of the hospitalized patients are just waiting for the arrival of necessary drugs and other supplies and/or for the repair of equipment.

The most recent data on the population's health-status and health-care utilization patterns stem from the Côte d'Ivoire Living Standards Survey, conducted in 1985. In terms of self reported health status, about 30 percent

of the population suffers from an illness or injury during any given four week period (Table 5). No major sex differentials exist, but there is a distinct age profile. Young children (0-5) show an incidence of illness and injury equal to the overall average, while older children (6-15) show the

Table 5. **Percentage of Individuals who Report an Illness or Injury During the Past Four Weeks; by Location, Age and Sex**

	Abidjan			Other Cities			Villages			Côte d'Ivoire		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	30.73	35.22	33.19	30.26	29.93	30.10	32.08	30.05	31.15	31.48	30.98	31.26
6-15	21.99	20.05	20.98	23.03	20.60	21.84	20.63	19.89	20.28	21.43	20.98	20.27
16-35	26.41	32.93	29.86	27.06	31.57	29.70	23.97	26.81	25.61	25.58	29.40	27.69
36-49	40.80	40.32	40.56	44.80	44.59	44.69	46.08	42.27	43.70	44.60	42.40	43.32
50+	32.05	42.00	35.94	57.52	51.22	54.24	54.80	55.73	55.26	52.77	53.09	53.32
Total	27.81	30.79	29.36	30.37	30.77	30.57	30.99	31.21	31.11	30.26	31.03	30.67

lowest incidence rate. Adults (16 and over) show a monotonous increase of illness with age.

Table 5 reflects the anticipated decline in health associated with age: the number of days during which individuals are restricted in their daily activities, due to an illness or injury increases with age. The average number of days in rural areas during which the individual could not pursue his or her normal activities is 7.7 for males and 8.7 for females, compared with little over five days in urban areas. Thus, while the incidence of self-reported health problems appears to be higher in the cities, health problems are on average more severe in rural areas.

Table 6. Average Number of Restricted Activity
Days During the Past Four Weeks; by Location, Age and Sex

	Abidjan			Other Cities			Villages			Ivory Coast		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	5.57	4.46	4.93	4.73	5.38	5.04	6.11	6.31	6.21	5.74	5.74	5.74
6-15	3.90	4.03	3.97	3.82	3.57	3.71	5.08	4.83	4.96	4.56	4.36	4.46
16-35	3.60	5.52	4.72	3.68	5.63	4.78	7.53	7.32	7.40	5.37	6.40	5.98
36-49	3.88	8.48	6.11	4.47	7.06	5.87	7.50	7.45	6.47	6.07	7.51	6.90
50+	8.36	10.29	9.24	10.17	7.73	8.97	10.97	12.47	11.71	10.66	11.53	11.09
Total	4.45	5.63	5.09	4.95	5.64	5.31	7.52	7.88	7.71	6.40	6.96	6.69

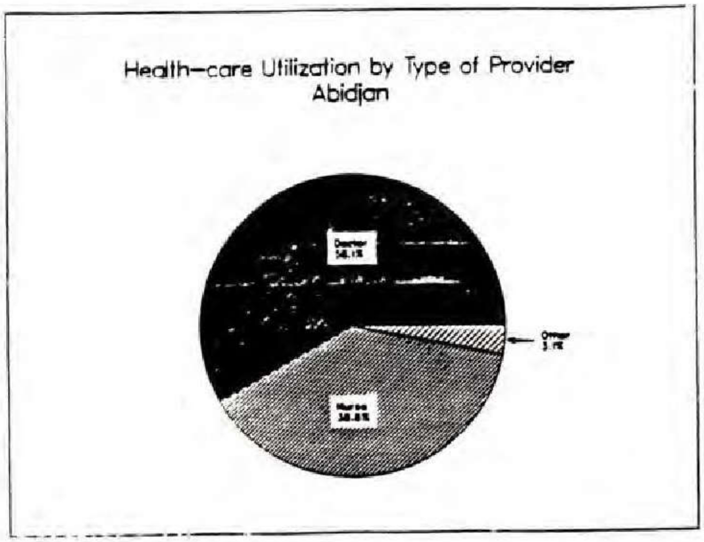
Table 6 shows the distribution of visits to formal health workers i.e. doctors, nurses and midwives. Since obstetric care is included in the table it is no surprise that prime age females usually obtain more medical care than prime age males. In the oldest cohort, where obstetric care is no longer relevant the reverse occurs: elderly females obtain less formal care than elderly males, with the exception of Abidjan. Although the elderly are less healthy than younger adults, they tend to consume less medical care, particularly in rural areas.

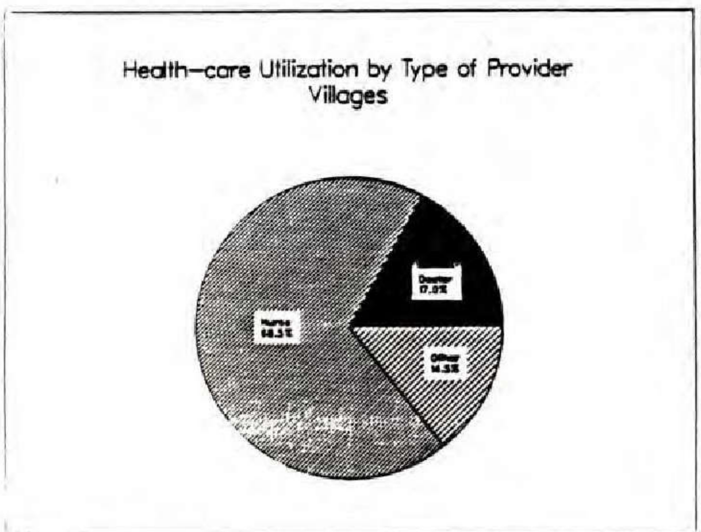
Perhaps the most important result in Table 7 is that in Abidjan 60% of the individuals who report an illness or injury obtain some form of medical care, while only 40% of those living in rural areas do. This quantitative difference in health-care utilization is aggravated by qualitative differences. Figure 1 show [illegible] 9.1% of the patients in Abidjan are treated by a physician and 38.8% by [illegible] In rural areas only 17.0% receive treatment from a physician, th[illegible] majority of the patients, 68.5%, see a nurse.

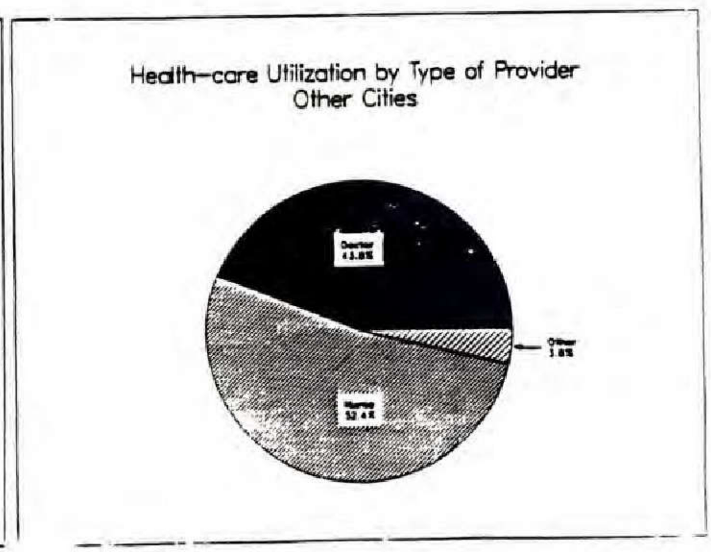
Table 7. **Percentage of Individuals with an Illness or Injury Who Obtained Medical Care**

	Abidjan			Other Cities			Villages			Ivory Coast		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Toral
0-5	68.25	68.97	68.67	69.57	60.25	65.00	46.26	41.91	44.36	54.36	51.44	52.99
6-15	50.68	61.64	56.16	50.45	52.08	51.21	41.94	40.85	41.43	45.60	47.64	46.56
16-35	53.95	62.20	58.72	53.85	57.49	55.89	39.59	47.33	44.27	47.52	53.88	51.26
36-49	60.78	68.00	64.36	62.50	59.09	60.66	45.39	38.89	41.46	52.42	47.29	49.48
50+	60.00	47.62	54.35	52.31	46.03	49.22	32.30	31.21	31.76	37.53	34.70	36.14
Total	57.45	63.54	60.77	57.05	55.63	56.32	40.59	40.10	40.33	47.30	47.95	47.64

FIGURE 1:


Health-care Utilization by Type of Provider
Abidjan


Health-care Utilization by Type of Provider
Villages


Health-care Utilization by Type of Provider
Other Cities

The data illustrate the severity of health problems in Côte d'Ivoire. Roughly one-third of the population is ill during any given 4-week recall period and, on average, those who are ill lose about one-quarter of their time due to illness. Health-care utilization is highly skewed in favor of urban dwellers, both in quantity and in qualitative terms. Just 40% of the ill in rural areas receive any type of medical care, most of this is provided by nurses, rather than physicians. Cost recovery is virtually nonexistent in Côte d'Ivoire, the health budget is shrinking as a percentage of the total government budget and the economic outlook for the country shows little if any per capita growth for the foreseeable future. Additional financial resources, other than general government revenues, need to be found, not just to maintain the current situation, but to make the major improvements that are necessary. Introducing user fees are one option. The desirability and feasibility of this option depend crucially on the willingness-to-pay for medical care, the main issue of this study. Our analytical work (Chapter 5), will focus on the determinants of health-care utilization in rural areas; on the basis of which we will estimate the willingness-to-pay for medical care. But first we will present a similar descriptive analyses of health and health-care utilization in Peru.

3.3 Health and Health-Care in Latin America

Peru, situated on the West-coast of the Latin-America continent is a country with a population of over 18 million people. With a *per capita* GNP of about $1000, the country is considerably better off than most of the West-African countries we briefly discussed above. As we show for selected countries in Table 8, this is generally true for Latin America: GNP *per capita* ranges from $1000 to $3410, i.e. well above the African figures, though Bolivia forms a poor exception with $540.

The health indicators are also well above those presented for Africa. (See World Health Organization, 1982, for a more extensive evaluation of health status in Latin American countries. See also Cox and Geletkanycz, 1977, for details on Peru). Life-expectancy in an average middle-income Latin American country is 65.6 years, as compared to 51.0 for a middle-income sub-Sahara country. The average infant mortality rate is 56.1 and the child death rate is 4.0. (Recall from Table 1 that these numbers are 103.2 and 17.6 for middle-income sub-Sahara countries). Primary school enrollment is about universal, but one-third of the population has still no access to safe drinking water.

TABLE 8: Socio-economic Indicators, Latin America; selected countries

	GNP per capita	Life exp. at birth	Infant Mortality Rate	Child Death Rate	% of Calory Requirements	Primary School Enroll-Ment	Access to Safe Drinking Water	Pop. per Physician (Thous.)	Pop. per Nurse (Thous.)	Pop. per Hospital (Thous.)
Venezuela	3410	69.4	37.8	1.6	99.2	105.0	81.0	1.0	0.5	0.3
Argentina	2230	70.1	34.4	1.3	119.2	107.0	57.0	0.5	0.6	0.2
Uruguay	1980	73.3	28.8	0.9	99.1	109.0	80.0	0.5	0.7	0.2
Brazil	1720	64.1	67.8	5.5	106	102.0	71.0	1.3	1.2	0.3
Chile	1700	70.1	21.8	0.5	105.5	111.0	84.0	1.0	0.5	0.3
Colombia	1390	64.7	48.4	2.7	109.7	120.0	92.0	2.1	1.0	0.6
Paraguay	1240	65.8	43.8	2.2	121.7	103.0	21.0	1.4	0.7	0.7
Ecuador	1150	65	67.2	5.4	89.2	115.0	51.8	2.1	1.1	0.6
Peru	1000	59.3	94.6	11.2	85	116.0	51.0	1.7	0.9	0.5
Bolivia	540	52.5	118.4	19.5	81.8	87.0	37.0	2.0	2.7	0.5
Reference Group										
Mid-Income LAC	1782.8	65.6	56.1	4.3	109.3	107.3	66.3	1.3	1.2	0.4

Source: Social Indicators of Development, 1986; World Bank.

As for the health-care infrastructure, we find on average one physician for every 1300 people and about an equal number of nurses. There is one hospital bed for every 400 people.

Thus, both the health indicators and the data on the health-care infrastructure show a considerably better picture in Latin-America than in sub-Saharan Africa. Of course, this does not come as a surprise, since the countries in sub-Saharan Africa that we discussed belong to the poorest in the world, while most Latin-American countries are middle income countries. Nor does it imply that from a health and medical-care point of view Latin-America is in good shape in absolute terms. For instance, though the infant mortality rate has seen a steady decrease, its absolute value of 56.1 is well above the rates usually found in the industrialized world. Moreover, the greatest proportion of infant mortality is still due to communicable diseases. The Pan-American Health Organization reports that 24 percent of all deaths of children between age 1-4 in Latin America resulted from infectious and parasitic diseases that are preventable by immunization. (Pan-American Health Organization, 1982).

As for the health-care infrastructure, urban-rural inequalities in access to medical care are a major problem. For instance, in Colombia, an estimated six million people, half the population, do not have access to primary care (Zchock, 1979). And, in general, in the battle over the scarce financial resources available for medical care, urban hospital facilities have won over rural primary care facilities and preventive activities.

In the next section we will take a closer look at the health-care system and its financing mechanism in one Latin-American country: Peru.

3.4 The Peruvian Health-Care System*

The dynamics of Peru's economic growth during the last twenty years have been shaped by two completely different approaches to managing the economy: a period of nationalistic popular reforms from 1968 to 1975 followed by a period of stabilization, structural adjustment, and liberalization from 1975 to 1985.

During the first period, a self-proclaimed Revolutionary Government of the Armed Forces seized power and promised to implement drastic social reforms such as nationalization, agrarian reform, educational reform, worker participation in the management of firms (Comunidad Industrial), and promotion of cooperatives and "social property." It introduced subsidies for oil, gasoline, and basic staple foods; prices of other basic products were also controlled and/or heavily subsidized.

The second period began in 1975 with a coup d'état against the reformist military government. A group of more conservative militarists seized power and called for a return to a more orthodox management of the economy, with more reliance on the private sector. In an attempt to reduce government deficits and disequilibrium in the external sector, the new government drastically reduced subsidies and dismantled several social reforms of the first period. The government was committed to a program of stabilization and the reorientation of the economy toward a free-market strategy of growth. A new civilian government came to power in 1980. Without changing the basic orientation in the management of the economy this

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* This section draws heavily upon Suarez, 1987. We are very grateful to him for allowing us to incorporate his material in this volume.

government began consecutive drastic but unsuccessful stabilization programs. It also began a medium-term strategy of structural adjustment leading toward trade liberalization.

Data in Table 9 show the behavior of some of the macro-economic aggregates during the two periods. During the 1970-75 period of popular reforms, average yearly rate of gross domestic product (GDP) growth was 4.8 percent, slightly below the historically high rate of 5.5 percent a year in the fifties and sixties. With a population growth rate of 2.7 percent a year, per capita income increased at an average rate of 2.04 percent. Also during this period inflation rose from a historically low yearly rate of about 5 percent to 13 percent in 1975 and 30 percent in 1976.

During the 1975-85 adjustment and liberalization period, while the population growth rate declined to 2.6 percent, the average rate of GDP growth dropped to 1.23 percent a year; per capita income declined by an average yearly rate of 1.23 percent. Inflation sky rocketed from 30 percent during the mid-seventies, to 60 percent in 1980, 110 percent in 1984, and 170 percent in 1985. Economic recession was particularly severe during the last five years of the structural adjustment and trade liberalization programs.

Between 1980 and 1985 the economy remained almost stagnant; GDP fell at a rate of 0.7 percent a year, and per capita income declined even faster at 3.4 percent a year. In 1985 income per capita was about 6 percent lower than at the beginning of the seventies.

TABLE 9. **Peru: Gross Domestic Product, Inflation, Population, Per Capita Income, 1970, 1975, and 1980-85**

	1970	1975	1980	1981	1982	1983	1984	1985
Real GDP, (bill. 1980 US$)	6.2	12.2	14.5	16.7	14.4	11.1	10.0	14.2
Rate of growth (p.a. real terms)	5.0	-0.5	0.1	3.1	0.6	-12.5	4.4	1.9
Inflation rate	5.0	13.0	59.2	75.4	64.4	111.2	110.2	169.9
Population (millions)	12.8	14.6	16.6	17.0	17.4	17.9	18.4	18.9
Income Index (1970=100) (real terms)	100.0	110.7	113.9	114.6	112.8	95.9	97.4	96.7

Source: Suarez, 1987.

During the first phase of the military government, after two years of austerity measures and policy reforms (1969-70), the government pursued expansionary fiscal policies. Government expenditures, as a proportion of the GDP, increased from an average of 16-18 percent during previous years to above 20 percent during the early eighties, Table 10. Revenues did not increase in proportion, and domestic and foreign borrowing were heavily used to finance rising government deficits.

TABLE 10. Peru: Public Sector Finances, 1970, 1975, 1980-85
(millions of intis)

	1970	1975	1980	1981	1982	1983	1984	1985
Central Government								
Total Expenditure	42.1	106.7	1046.7	1830.2	2634.0	6048.0	10728.3	23869.0
Total Revenue	38.8	88.6	1008.4	1509.7	2459.6	3732.0	5228.1	21667.0
Deficit	-3.3	-18.1	-38.3	-320.5	-174.4	-2316.0	-5500.2	-2202.0
Total Government								
Expend/GDP (%)	17.5	19.4	21.1	22.1	19.1	23.9	18.8	15.4
Deficit/GDP (%)	-1.4	-3.3	-0.8	-3.9	-1.3	-9.1	-9.6	-1.4

Source: Suarez, 1987.

Government deficits, around 3-4 percent of GDP between 1971 and 1974, increased to 6 percent in 1976 and 7.5 percent in 1977. At this time the government attempted to control government expenditures. Favorable export prices, resulting in additional export tax earnings, were used in part to balance the budget. Thus government deficits, as a proportion of GDP, were reduced to 4.7 percent in 1978, 0.5 percent in 1979, and 0.8 percent in 1980.

During the eighties, amidst a process of structural adjustment and liberalization, inconsistent expansionary fiscal and monetary policies were pursued. From 1980 to 1984 high government expenditures continued; in 1984 total government expenditures represented almost 24 percent of GDP. An unsuccessful reform of the tax system and the economic recession resulting from falling terms of trade led to a drastic reduction of government revenues. Deficits rose sharply from 2.8 percent of GDP in 1980 to more than 9 percent in 1983 and 1984.

Increases in government expenditures have not been uniform for all government functions. Between 1973 and 1981 the most important changes were reductions in the share of government expenditures on such social programs as health, education, housing and community activities. Expenditures for these social programs declined from approximately one-third of the total budget in 1973-75, to less than one-fifth in 1981. In 1981 a single item--other purposes--absorbed the largest proportion of total government expenditures. This item comprises mainly the interest and amortization payments on domestic and foreign public debt. Debt-related payments increased from 10 percent of government expenditures in 1973 to 21 percent in 1981. Estimates for 1984/85 show that these payments represented 25-27 percent of total government expenditures.

Thus, the overall picture of the eighties is that of a government struggling to stabilize the economy. The budgetary pressures are such that expansion of the outlays for the social sectors is virtually out of the question. Return of the economy to the path of sustained economic growth, so illusive during the eighties, is still no in sight.

The implications of these developments for the health-care sector could be severe. Despite major progress during the past decades, much remained to be done to improve the health-status of the population. Table 11 summarizes the evolving pattern of the mortality, life expectancy, and infant mortality rates from selected years from the fifties to 1986. In 1986 average life expectancy at birth is estimated at 60.8 years, which is below the average life expectancy rate of 61.2 years for other Latin American countries and the average of 71 years for the developed countries.

TABLE 11. **Peru: Evolution of Health Status Indicators, Selected Periods (per thousand)**

	1950-55	1975	1980-85	1986
Crude Birth Rate	47.0	39.4	37.0	35.0
Crude Mortality Rate	21.6	12.2	11.7	9.7
Infant Mortality Rate (a)	156.0	106.6	99.0	90.5
Fertility Rate (b)		5.6	4.9	4.7
Life Expectancy at Birth	44.1	56.5	58.9	60.8

(a) Live birth, up to one year.
(b) Per woman in child bearing age.

Source: Suarez, 1987.

As in most developing countries, the evolution of the life expectancy shows that after a significant increase in life expectancy during the fifties and sixties, the rate of increase leveled off during the last decade. Cumulative increases in life expectancy declined from 13 percent between 1960 and 1970 to less than 5 percent during the last ten years (1975-85). For developed countries life expectancy leveled only after it reached 70 years.

Data also show that whereas both birth and mortality rates have been declining, infant mortality remains high, which is the most important factor explaining the relatively low life expectancy and still high crude mortality rates. Peru's infant mortality rate is about 90 per thousand; it is one of the highest among Latin American countries and is in sharp contrast to the infant mortality rates of the most developed countries, whose rates range from 10 to 20 per thousand.

Given the overall economic outlook, it is unlikely that much improvement in these health indicators can be expected to result from the overall improvement of living conditions that is associated with economic growth. Rather, increased efforts in the provision of medical care are called for, if not to increase the health status of the population then, at least, to protect current levels from the detrimental effects of a further decline in the economy.

Again, the major question is where to find the resources necessary to pay for maintaining and, indeed, improving the current health-care system? Currently, the Peruvian health system is a combination of programs and institutions from government and non-government organizations. The public health-sector, comprising all institutions providing both preventive and curative health services to the general public, has 116 hospitals, 463 health-centers and 1,405 sanitary posts (1983-84, Table 12). Though access to these services is generally free of charge, the regional availability and other forms of non-price rationing (e.g. space availability) effectively reduces the coverage to an estimated 56 percent of the population.

The corporate sector (mainly social security funds, army, police, state owned firms and agricultural cooperatives) covers about 16 percent of the population, while the private sector, with an equal number of hospitals as the public sector, covers just 1.8 percent.

TABLE 12. **Peruvian Health Institutions and Coverage (1983-84)**

	Hospitals	Health Centers	Sanitary Posts	Other	% Pop. Covered
Public Health Sector	116	463	1405	13	56.5
Corporate Sector	98	149	130	0	16.6
Private Sector	116	18	3	4	1.8
Total	330	630	1538	17	74.9

Source: Suarez, 1987.

Although most policy debates on financing health programs concentrate on financing the public health sector, this sector's expenditures represent only about 10 percent of total health expenditures (Table 13). Expenditures of the corporate health sector and private households on health-related goods and services represent about 90 percent of total expenditures. These results show a further need to explore the role that the corporate and private sectors could have in implementing health programs.

TABLE 13. **Composition of Health Expenditures in Peru (around 1980-84)**

Sectors	Coverage	Expenditure US$ per capita	Total Expenditure % of the GDP	Sectorial Share (%)
Public Health Sector	56.5	10 to 17	0.6 to 0.8	10
Corporate Health Sector	16.6	100 to 130	2.3 to 3.1	45
Private Sector	1.8	11 to 20	2.1 to 3.5	45
TOTAL	100.0	55 to 77	5.0 to 7.0	100

Source: Suárez, 1987.

Still, more than half of the population has to rely on public health services, not counting the estimated 25% of the population that has effectively no access to any form of medical care.

The latter is a direct result of the skewed geographical distribution of health-care facilities. Hospitals are heavily concentrated in the metropolitan area and other major cities. Health centers and health posts are better distributed but shortages are still evident, especially in the more remote rural areas (Carrille, 1986). Moreover, health facilities in rural areas show a high degree of deterioration. For instance, in the Cuzco and Cajamarca regions health facilities function at less than 50 percent of their capacity due to deteriorated equipment, while 80 percent of the health posts do not have water and sewage facilities (op cit., p.19).

The skewed distribution of health-care facilities mimics the overall distribution of welfare. Average per capita income in Lima was 770 intis per month in 1985/86, but less than half of that in the rural Sierra area (Table 14). Only 6 percent of the poor live in the metropolitan area, and over 50 percent live in rural Sierra, though both areas have approximately the same population.

TABLE 14. **The Distribution of Households by Quintiles**
(percentages)

Characteristics	All Peru	Quintile (Lowest) 1	Quintile 2	Quintile 3	Quintile 4	Quintile (Highest) 5	Mean Expenditure Per Capita (Intis per month)
Region							
Lima	26.8	6.0	18.2	28.8	35.4	45.5	770.9
Coastal Urban	15.2	11.1	14.7	17.6	15.4	17.2	569.8
Coastal Rural	7.2	8.8	9.8	7.2	6.8	3.5	421.3
Sierra Urban	11.0	9.0	9.6	10.2	11.5	14.8	649.9
Sierra Rural	30.5	52.8	38.5	28.1	22.9	10.4	366.8
Selva Urban	3.0	2.1	2.8	2.3	3.0	4.7	792.0
Selva Rural	6.3	10.3	6.5	5.8	3.9	413.5	
	100.0	100.0	100.0	100.0	100.0		

Source: Glewwe, 1987.

TABLE 15. **Percentage of Individuals with an Illness or Injury in Peru; by Location, Age and Sex**

	LIMA METRO			OTHER URBAN			RURAL			PERU		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	62.23	64.06	63.16	49.53	50.59	50.05	41.67	42.57	42.10	47.61	49.17	48.37
6-15	40.36	45.18	42.71	30.85	33.12	31.97	29.57	32.40	30.95	32.41	35.52	33.93
16-35	40.13	47.64	44.01	32.80	39.52	36.28	32.13	36.45	34.35	34.88	40.94	38.01
36-49	47.15	60.31	54.22	40.68	52.03	46.53	41.42	53.51	47.50	42.74	55.09	49.11
50+	51.68	62.84	57.46	46.35	63.97	55.46	57.61	65.49	61.88	53.25	64.42	59.02
Total	45.36	53.01	49.27	37.45	44.19	40.48	38.00	42.96	40.48	39.76	45.98	42.89

TABLE 16. **Average Number of Restricted Activity Days During the Past Four Weeks; by Location, Age and Sex**

	LIMA METRO			OTHER URBAN			RURAL			PERU		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	2.12	1.80	1.95	2.50	2.30	2.40	3.12	2.96	3.04	2.70	2.47	2.58
6-15	1.62	1.09	1.35	1.32	1.40	1.36	2.01	1.98	1.99	1.72	1.57	1.64
16-35	1.38	1.26	1.31	1.87	1.64	1.74	2.31	2.10	2.20	1.85	1.66	1.74
36-49	1.70	1.86	1.80	1.84	1.66	1.76	2.85	2.59	2.70	2.27	2.13	2.19
50+	1.64	3.06	2.44	2.42	3.47	3.05	3.98	3.46	3.70	3.06	3.36	3.23
Total	1.64	1.70	1.67	1.96	2.05	2.01	2.84	2.62	2.72	2.26	2.18	2.28

Table 15 and 16 show the percentage of people who report an illness or injury and the number of restricted days of those who are ill, respectively. The patterns are similar to those in Côte d'Ivoire: the

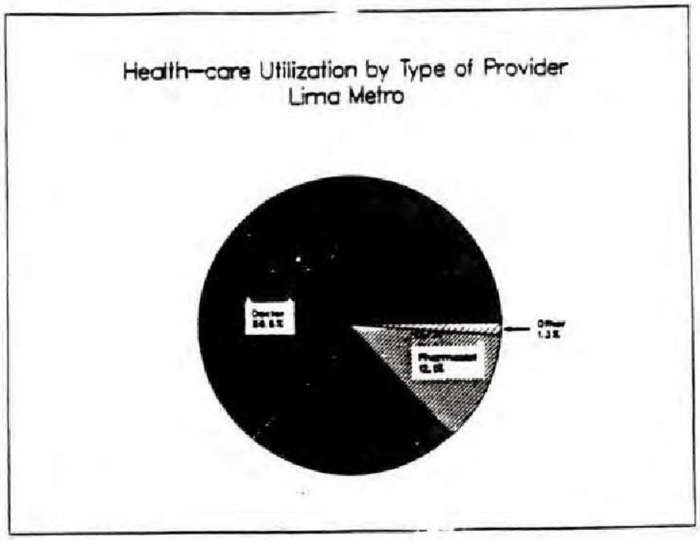
incidence is higher in urban areas, but the severity of il ess is higher in rural areas.

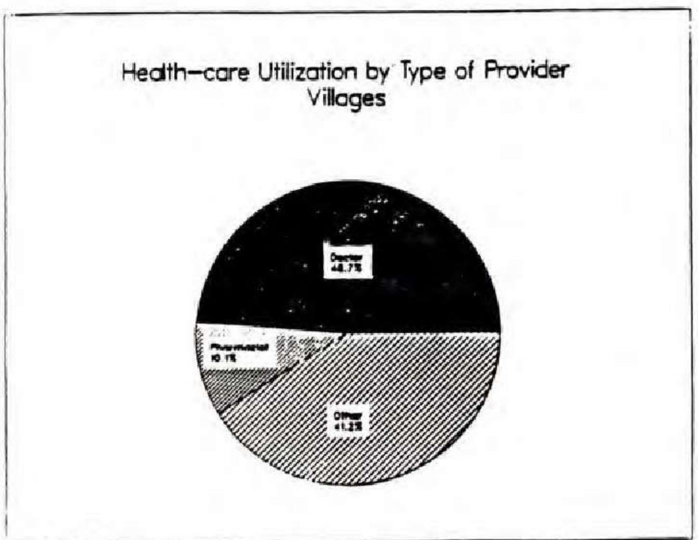
Almost half of the ill or injured in Lima receive some form of medical care, but the number for rural areas is less than 30 percent (Table 17). This quantitative differential is aggrevated by qualitative differences. Over 85 percent of medical care in Lima is provided by doctors. In the rural villages less than half of the patients receive their medical care from a physician, 10 percent receive it from a pharmacist, while 48 percent obtain care from a doctor (Figure 2).

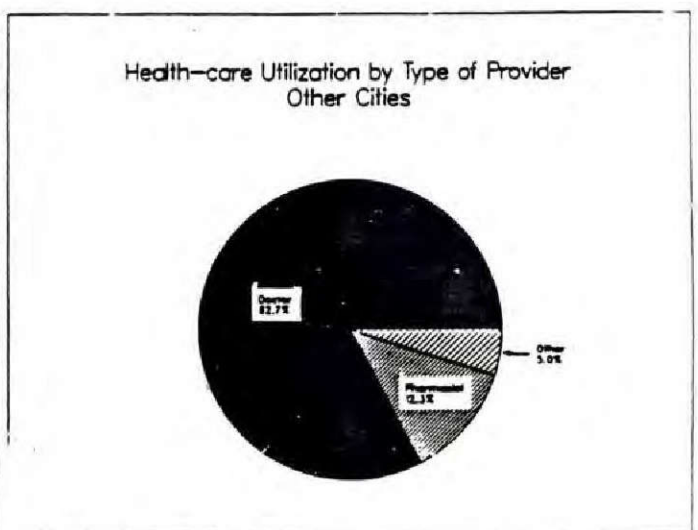
TABLE 17. **Percentage of Ill Individuals Who Obtained Medical Care; by Location, Age and Sex**

	LIMA METRO			OTHER URBAN			RURAL			PERU		
Age	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-5	58.76	56.83	57.76	53.38	53.67	53.52	31.31	29.74	30.55	44.01	43.46	43.73
6-15	49.25	36.52	42.69	32.90	38.49	35.74	26.05	21.70	23.82	34.50	30.34	32.37
16-35	46.96	44.02	45.32	45.53	45.91	45.74	30.90	29.29	30.02	40.83	39.50	40.09
36-49	43.00	54.40	49.81	52.51	50.62	51.42	33.02	34.37	33.78	40.88	44.79	43.14
50+	53.48	55.48	54.61	51.23	47.00	48.71	32.93	30.20	31.43	42.05	40.77	41.33
Total	49.90	48.05	48.88	46.00	46.62	46.34	30.61	28.79	29.64	40.25	39.40	39.79

FIGURE 2:


Health–care Utilization by Type of Provider
Lima Metro
Doctor
86.6%
Other
1.3%
Pharmacist
12.1%


Health–care Utilization by Type of Provider
Villages
Doctor
48.7%
Pharmacist
10.1%
Other
41.2%


Health–care Utilization by Type of Provider
Other Cities
Doctor
82.7%
Other
5.0%
Pharmacist
12.3%

In sum, the evidence calls for major improvements in the Peruvian health-care system, especially in rural areas. At the same time, the overall economic outlook calls into question the future availability of government resources to make those improvements. The large urban/rural differentials suggest that there is room for redistributional policies to partly improve the rural health-care system. The introduction of user fees may be another option.

3.5. Summary

In this chapter we discussed the health-care systems in two countries, Côte d'Ivoire and Peru, against the background of the overall macro-economic situation. The two countries are very different and are situated in vastly different continents. Still, a number of similarities emerged that are relevant to this study. First, both countries pursued a health-care policy in which the government provides medical care free-of-charge. In Peru, the corporate and private sector complement the public sector in urban areas, but in rural areas the population still has to rely merely on government provided services.

Second, the economic situation in both countries puts sever constraints on the government budget, making it all but impossible to increase the health budget in order to provide additional resources for expanding the medical system. Third, most public services accrue to the better-off urban dwellers, while the rural population has limited access to public facilities. Moreover the quality of these facilities leaves much to be desired.

All evidence makes it painfully obvious that additional resources are necessary to provide medical care of sufficient quality to rural areas. Resources that can not be found in the government's budget. Are user fees the answer? For urban areas, or - more precisely - for better-off households in urban area, the answer to this question seems clear. There are no clear theoretical arguments in favor of across the board subsidies for curative care. Given the very limited resources available to provide medical care, it makes sense to charge those consumers that can afford it for medical goods and

services provided by the government, especially for curative care. Public resources thus saved could be used to help upgrade rural health-care facilities and subsidize care for the rural poor. But should user fees also be charged in rural areas for primary care facilities? In the rest of this book we will try to answer this question, based on detailed empirical analyses of the general health-care utilization patterns presented in this chapter. In the next chapter we will first make the issues related to health-care financing more precise and then present the general theoretical framework on which the empirical analysis will be based.

CHAPTER 4

Analytical Issues in Health-Care Financing

4.1. Introduction

As became clear in the previous chapters, health-care systems in the developing world face a multitude of problems that can not be solved overnight. Many of these problems will not be discussed at any length in this volume. They include questions related to the overall "optimal" outlay for medical care - as compared to, say, expenditures for education or railroads - the appropriate mix of public and private expenditures for medical care, the apparent need to shift resources from curative to preventive care, the desired curricula for health workers, the balance of payments implications of drug imports, etc. High on the list of major problems that urgently need to be dealt with is the question of how to finance medical care. How can sufficient resources be generated to maintain a health-care system of acceptable quality, without putting up financial barriers that deny access to the system to all but the richer few? This is the issue that we address in the rest of this volume, with a focus on curative primary care in rural areas.

This chapter discusses how various aspects of this problem can be approached analytically. Section 2 discusses options for resource mobilization and especially the pro's and cons of introducing prices (user fees) into the system. We will show, in general terms, how the issues of equity and efficiency that are implicit in these options can be addressed empirically if we improve our knowledge of the determinants of the demand for medical care, especially regarding the effects of income and prices.

Section 3 formalizes this discussion. It introduces the general framework used by economists to conduct the type of welfare economics that is called for, provides a formal definition of the willingness-to-pay for medical care and shows how - armed with a properly specified model of the demand for medical care - we can answer such questions as how much revenues can be raised or who wins/loses under various policy scenario's. The theoretical apparatus thus developed will be applied in the following chapters to empirically address these issues using data from Peru and Côte d'Ivoire.

4.2. Alternative Options For Health-care Financing

In the previous chapter we showed the dismal state of the health-care systems in two developing countries, Côte d'Ivoire and Peru. We argued that, in general, the way in which these countries finance their health-care systems has contributed to the problems. In this respect these two countries are not exceptional. The World Bank Policy Study on Financing Health Services in Developing Countries states:

> "Problems in the health sector in developing countries can be summarized under three headings; allocation-insufficient spending on cost-effective health programs; internal efficiency-wasteful public programs of poor quality; and inequity-inequitable distribution of health services" (World Bank, 1987, p.13)

The fundamental cause of these problems is identified as "poor approaches to financing". As we have seen, the vast majority of financial resources for health services comes from government revenues or other general funds (such as social security plans), (see also Jimenez, 1987; Katz, 1987). Only a tiny fraction of the cost is recovered from direct payments by the

consumers. If one could increase count on sustained economic growth, a rapid increase in the government budget for health-care may help to sustain the current health-care infrastructure, to make the necessary quality improvements and to expand the system to meet the needs of the growing and aging population. However, the economic outlook of most developing countries show sluggish growth at best, while the global reevaluation of the role of governments in the process of economic development calls for less rather than for more government expenditures.

Thus, the question is not whether additional resources, other than government revenues, need to be found to strengthen the financial basics of the health-care system, but where and how. When government funds are insufficient to provide medical care for those in need, there is only one alternative: charge the consumer.

This dichotomy between government financed medical care and user charges is somewhat artificial. First of all, the government needs revenues to cover its expenditures, revenues it obtains by taxing the citizens. The inequities of the various tax systems in developing countries (as well as in the industrialized world) warrant a study of their own, but this is beyond the scope of this volume. Secondly, consumer's can pay for the goods and services in various ways, either directly at the time of consumption, or through pre-paid private insurance or compulsory public insurance schemes. If in the latter case health-care is provided free of charge, the difference to the consumer, between government financed and privately paid (but fully insured) medical care is negligible. Indeed such a system is likely to suffer from many of the same problems that characterize a government financed system. Though, of course, in the fully insured health system prices can still play a role, for instance as incentives to the provider to improve efficiency.

In sum, there is a continuum from a system that is completely financed by the government, and in which prices do not play any role, to a completely market oriented system in which prices are used by consumers and producers to allocate the scarce resources available for medical care. We will use the fully government funded health-care system as an extreme case and compare it with one in which additional revenues are raised through user charges.

As stated in Chapter 1, this study is not concerned with the effect of prices on the suppliers of medical care; our focus is on the effects of prices on the consumer. Money prices faced by the consumer can be changed by increasing or decreasing government subsidies or by altering the insurance coverage. But, as we will argue below, money prices are not the only relevant cost to the consumer; other private costs - such as travel cost and lost time for traveling and waiting - also are important.

The main question we will try to answer in the next chapters is: are user fees a viable alternative to government revenues for financing medical care? The answer to this question depends ultimately on the weights one attaches to the equity and efficiency consequences of introducing user fees. These weights reflect the government's preferences or social welfare function. It is unlikely that they can be determined empirically with reasonable precision. What can be determined empirically is what is likely to happen, both in terms of equity and efficiency, if a policy is implemented that introduces user fees or reduces subsidies in a system that previously provided medical care free of charge (or at highly subsidized prices).

The first set of questions that need to be answered is: how do demand patterns change as a result of such a policy? Will people make more/less use of certain health-care providers? Who will opt out of the system, either by not consuming medical care at all or by substituting away from the public system to private providers?

The second set of questions pertains to the welfare consequences of the policies (again, from the consumer's point of view). Who's welfare will be increased/decreased by the fee policies? Are the poor being more/less effected than the rich? Are these options to off-set the negative welfare effects?

Finally we need to address the resource mobilization question. Since, the proposal to raise user fees is motivated by the general lack of financial resources for the health-care system, the question arises whether those fees can be set high enough to raise the revenues necessary for improving the health-care system.

The answer to all these questions depend ultimately on the consumers' reactions to such policies. To be more precise, if prices are irrelevant for the consumption of medical care, i.e. if patients demand medical care only on the basis of their medical needs, irrespective of the economic costs, it makes imminent sense to set the fees equal to their marginal costs. In that case one can obtain full cost recovery without welfare implications. This, of course, is an unrealistic example. Consumers are sensitive to prices, even in the case of medical care (that is exactly why medical care is provided free of charge or as subsidized prices).

Thus the questions boil down to how sensitive consumers are to price changes, how this differs for households in different income groups and which

other determinants of the demand for medical care are important and can, perhaps, be used to off-set some of the negative effects.

In the next section we will show how the economic tools of demand and welfare analyses can be used to answer these questions empirically.

4.3. The Welfare Analyses Of Health-care Demand

The starting point for an economic welfare analysis is a decision making unit that, given limited resources and other constraints, tries to maximize it's own welfare. This welfare maximizing unit is usually an individual or a household, but the general theory can equally well be applied to a government, a firm or a hospital. If the unit is a firm "welfare" could be equated to "profits", which are observable. In that case, the decision problem boils down to one of profit maximization. If the unit is a household or individual, welfare is less easily defined. Indeed analysts make do with a vague notion of welfare, or "utility", that is not measurable but is assumed to be derived from the consumption of goods and services. In its most general form "goods and services " can include leisure or savings but also such intangibles as good health. Consequently the empirical counterpart of this theoretical frame work is the consumption of a bundle of goods and services that either directly contributes to welfare, or indirectly, for instance because they contribute to good health which in turn contributes to welfare.

Thus, households are assumed to choose the bundle of goods and services that maximizes their welfare. The constraint they face is their command over limited resources. Furthermore, they are guided in their choices by the relative prices of the goods and services under consideration. The

analyst observes the household's consumption behavior, the household's total income and the prices in the market. Given the theoretical welfare maximizing framework, these data suffice to make inference on the relative levels of well-being of the households and thus on how these welfare levels change under various policy scenario's. These policy scenario's usually take the form of a change in relative prices or a change in income. We will show below that, prices should be interpreted broadly to include, for instance, the cost of time spent to obtain the good. But first we will formalize this general framework for welfare analyzes.

We will denote a vector of K goods and services as $x = (x_1, x_2, \ldots, x_k)$. Their respective prices are $p = (p_1, p_2, \ldots, p_K)$, and a household's total income is Y. Households are assumed to maximize a utility function U, defined over a bundle of goods and services x, when prices are p and income is Y. In formula:

$$\max_x U = U(x_1, x_2, \ldots, x_K) \qquad (1)$$

$$\text{subject to } Y = \sum_{i=1}^{K} p_i x_i$$

The budget constraint says that total expenditures cannot exceed total income.

The result of this maximization problem is the bundle of goods and services chosen by the household. The amounts consumed of each item depend in general on income and all prices. This set of demand equations can be written as follows:

$$x_1^0 = x_1(Y, p_1, p_2, \ldots, p_K)$$
$$\vdots$$
$$x_i^0 = x_i(Y, p_1, p_2, \ldots, p_K) \qquad (2)$$
$$x_K^0 = x_K(Y, p_1, p_2, \ldots, p_K)$$

where x_i^0 denotes the optimal quantity of consumption item i.

Substituting (2) into the utility function (1) yields a so-called indirect utility function:

$$U^0 = U^0\ (Y, p_1, p_2, \ldots p_K) \qquad (3)$$

This function shows the maximum welfare level, U^0, that can be reached with income Y, when prices are p. The most useful tool for welfare analyses is the inverse of this function:

$$Y = C(U^0, p_1, p_2, \ldots, p_k). \qquad (4)$$

This function, called a cost function, shows how much income is needed, Y, to obtain a given welfare level, U^0, when prices are p.

Since this cost function answers the question of <u>how much</u> does it cost (how much income is needed) to obtain a given welfare level when prices are, say, p^0, it can also show <u>how much more</u> it will cost if we raise prices to p^1. Thus, with the use of equation (4) we can calculate the additional income a household needs to stay at the same welfare level when prices move

from p^0 to p^1. This amount is in the economic literature known as the <u>compensating variation</u> (e.g. Deaton and Muellbauer, 1980).

Let us compare two situations, the only difference between the two is a change in the price of good i, from p_i^0 to p_i^1. Before the price change the cost function reads

$$Y^0 = C(U^0, p_1, p_2, \ldots, p_i^0, \ldots, p_K) \tag{5}$$

after the price change we have

$$Y^1 = C(U^0, p_1, p_2, \ldots, p_i^1, \ldots, p_K) \tag{6}$$

In order to compensate a household for the welfare loss incurred by raising one of the prices, we need to pay the household the amount of $(Y^1 - Y^0)$ the compensation variation. We will now show how this theoretical framework can be used to address the main questions of this study.

Let p_f be the fee for obtaining medical care and p_t be the sum of all other costs (travel time, waiting time, travel costs, etc.), then

$$p_m = p_f + p_t \tag{7}$$

where p_m is the total costs of medical care.

Equation (7), simple as it is , will play a major role in our subsequent analyses. First of all, as we will show in Chapter 5, it will allow us to obtain price elasticities for medical care even when p_f, the user fee, is zero. Secondly, it will allow us to address such questions as: if we

increase the fee for care, p_f, how can we compensate for the corresponding welfare loss (e.g. by reducing various aspects of p_t)? The issue of welfare compensation will be addressed with the help of equation (4), the cost function.

If p_i^0 in equation (7) represents the total cost for medical care, i.e. the sum of the fee p_f and the private costs p_t, and p_i^1 in equation (6) is the new total cost, resulting form the reduction in p_t and and increase in p_f, then $(Y^1 - Y^0)$ is the amount of money that leaves the household equally well-off in both situations. In other words, the compensating variation $(Y^1 - Y^0)$ is the maximum amount a household is willing to pay for the improved access (e.g. reduced travel time) to a clinic or hospital.

This willingness-to-pay notion is exactly what is needed to discuss the welfare effects and revenue potential of introducing (or increasing) user fees for social services. It should be sharply distinguished for someone's ability-to-pay. This latter notion is sometimes used in reference to the consumption of other goods, mostly luxuries such as alcohol or theatre tickets. As long as someone's expenditures on such luxuries exceed the expected costs of medical care, it is judged that he or she is able to pay for medical care.

Unfortunately, someone's ability to pay is only relevant for policy evaluations if one can coerce the person into consuming the goods or services. In the more common situation where one has to rely on people's choices, we can infer from observed consumption patterns whether one is willing to pay for the goods or services.

This completes the theoretical framework necessary to formally address some of the issues discussed in the previous section. The empirical

work starts with the observation of these consumption patterns, i.e. with the estimation of the system of demand equations given in (2). Of course, many factors other than income and prices influence the demand for goods and services. For instance, if the analyses take place at the household level, the size of the household needs to be taken into account. Or, if the focus of the analysis is on any specific item (such as medical care), factors such as education, sex or the age of the individual will play a role. If we denote all such intervening variables by $h=(h_1,h_2,\ldots,h_L)$, we can write the vector of demand equations as:

$$x = x(Y,p;h) \tag{8}$$

This system of demand equations can be estimated from household survey data, provided that sufficient variation in the price vector p is observed. That is often not the case. However, as stated above, prices should be interpreted broadly; the cost of obtaining medical care is not only the fee to be paid to the doctor, but also includes the time and cost of traveling to the clinic or hospital as well. These private costs are specific to the household or the individual. Thus, even when money prices (fees) are the same for all individuals, the total cost of obtaining care is likely to vary. It is this variation in the individual cost of obtaining medical care that allows us to estimate price responses even if money prices (fees) are zero. Subsequently, the price responses will allow us to perform the necessary welfare analysis, as outlined above.

4.4. Summary

This chapter provided a brief introduction to the economic tools necessary to answer questions related to the effect of user fees on the demand for medical care and the subsequent welfare and budgetary implications. The theoretical framework provided a precise definition of the willingness-to-pay for medical care. We argued that willingness-to-pay and not ability-to-pay is the appropriate criterion to judge the feasibility and desirability of alternative pricing policies.

The theoretical framework also serves as a guide for the subsequent empirical work. First, using observations on current consumption patterns of medical care, demand equations need to be estimated to quantify the influence of such variables as income, price (including travel time, etc.), education, family size, etc. Secondly, on the basis of these demand equations, price elasticities can be calculated that show how price sensitive consumers are, and how this price sensitivity differs among various consumer groups. Finally, armed with this empirical evidence, the tools of welfare economics can be used to quantify the welfare and budgetary implications of various policy scenarios.

In Chapters 6 and 7 we will systemmatically go through these three stages of empirical work. But first we will further specify the analytical framework in order to make it more suitable for studying the determinants of the demand for medical care. Our starting point is the literature on health economics, especially as it focusses on the role of income and prices.

CHAPTER 5

Modeling the Demand for Medical Care

5.1 Introduction

As discussed in Chapter IV, evaluation of the feasibility and desirability of a user fee plan requires an *ex ante* evaluation of the utilization, revenue, and welfare consequences. This, in turn, requires knowledge of the properties of the demand function, especially price elasticities and the effects of other non-monetary costs such as travel time. The price elasticities provide information about how user fees will affect utilization and revenues. Travel time effects can be used to measure the amount individuals are willing to pay for improved access (reduced travel time). If governments open new social service facilities in rural areas, (thus making people better-off by improving access), then the willingness-to-pay is the maximum price increase that can be charged for these facilities without making individuals worse off.

The usually straight-forward exercise of demand estimation is greatly complicated for the case of health care by the fact that there is often little or no price variation within a country. In many developing countries the vast majority of medical services are run by governments who set prices close, and in many cases equal to zero. Even when prices are positive, they are typically uniform within the country. A second complication in modeling the demand for medical care is that the decision to use services is discrete. For example, individuals choose whether to visit a clinic, hospital, private doctor or not to obtain care at all (i.e. treat themselves). A third issue, and one that is not restricted to medical care, is that the effects of user

fees are likely to vary by income so that the distributional consequences must be considered. Indeed, if the poor are more price sensitive than richer individuals, user fees will reduce the utilization by the poor more than by the rich. In this case, uniform user fees would be regressive.

In this chapter we derive a discrete choice specification of the demand for medical care from a utility maximizing theoretical model and show how private time-price variation can be used to identify the parameters necessary to compute price elasticities and willingness-to-pay measures (compensating variations). The model makes use of the well known result that private prices, such as the opportunity cost of time, ration the market when monetary prices are absent or small (Becker, 1965). An added advantage of the model is that the theoretical framework naturally leads to an empirical specification that is flexible enough to allow the price elasticities and willingness-to-pay measures to vary by income levels.

The chapter is organized as follows. A review of the literature on the demand for medical care is provided in the next section. Then, a theoretical model of medical care provider choice in derived, and it's empirical counter-part specified.

5.2 Evidence from the Literature

The early literature on the demand for medical care in developing countries suggests that prices are not important determinants of medical care utilization. Akin et al. (1984, 1986), Schwartz (1988), Birdsall and Chuhan (1986), Heller (1982), all report very small and sometimes positive price effects, most of which are statistically insignificant. More recent work by

Mwabu (1986 and 1988), Gertler, Locay, and Sanderson (1987), Alderman and Gertler (1988), and Cretin, Keeler, Williams and Shi (1988) conclude that prices are important. All of the above studies except for Cretin et al. are discrete choice provider modes. The Cretin et al. study examined household medical expenditures in China and report that differences in coinsurance rates explain one-third of the variation in medical care expenditures.

The results of the early studies contrast sharply with most recent studies on the demand for medical care in developed countries which uniformly conclude that prices are important determinants of medical care utilization. The most important and comprehensive of these studies is the Rand Corporation's National Health Insurance Study (HIS), which was a 5 year controlled randomized trial experiment conducted in five sites in the U.S. with over 20,000 individuals (Manning et al., 1987). The HIS provides overwhelming evidence that prices are statistically significant determinants of health-care utilization. Price elasticities are found to be of the order of -.2. Moreover, the HIS results are on the low end of the prices elasticity estimates from the non-experimental literature, which finds statistically significant price elasticities ranging from -0.2. to as high as -2.1 (For example see Rosset and Huang, 1973; Davis and Russel, 1972; Phelps and Newhouse, 1974; Goldman and Grossman, 1978; Colle and Grossman, 1978; Newhouse and Phelps, 1974 and 1976).

The divergence between the literature on developed and most developing countries is somewhat paradoxical. Indeed, one would expect prices to be less important in the developed world than in the developing world. Two reasons are immediately apparent: (1) income levels are substantially higher in the developed world, and (2) medical care insurance is almost universal in

the developed world and is virtually non-existent in developing countries. Higher income levels and pervasive insurance coverage imply that medical care is a much smaller percentage of budgets in the developed world than in the developing world. One would expect individuals to be more sensitive to prices when these prices are bigger shares of this budget.

In addition, evidence from estimated income elasticities suggests that price elasticities should be higher in developing countries. We know, from the Slutsky decomposition of the price elasticity of demand that the price elasticity increases with the income elasticity, ceteris paribus (e.g. Deaton and Muellbauer, 1980). The empirical evidence shows that the demand for medical care is more income elastic in the poorer-developing countries than in the richer-developed countries. Engel curve estimates for medical care in Birdsall and Chuhan (1983) and Musgrove (1983) report income elasticities close to unity, whereas income elasticities between .2 and .3 are typically found for developed countries (for example see Van de Ven and van der Gaag, 1982; Holtmand and Olsen, 1978; Colle and Grossman, 1978; Goldman and Grossman, 1978;, Phelps, 1975, and Manning et. al., 1987).

In most developing countries, the price of medical care at government run facilities is small and in many cases zero. Hence, it is not surprising that prices do not ration the market. Acton (1975) and others have shown that when monetary prices are small, the price of time (ie. the opportunity cost of time used for obtaining the good) rations the market. One would expect, therefore, that time prices ration the market in developing countries. Indeed, in almost all of the studies on the demand for medical care in developing countries cited above, travel time is an important and significant

determinate of medical care demand. These results suggest that when monetary prices become larger, they will begin to ration demand as well.

How then can we explain the paradoxical results of zero price elasticities in developing countries? One explanation is that the models of medical care demand in developing countries are mis-specified. The studies typically model demand as a discrete choice with the price effect specified to be independent of income. This assumption is restrictive, since one would expect the wealthy to be less sensitive to price differences among providers than the poor. In fact it can be shown that these models are inconsistent with utility maximization (Gertler, Locay, and Sanderson, 1987). This point is demonstrated explicitly in the next section. Another possible cause for the paradoxical result is more straight forward. Many of the studies of medical data use sets of dubious quality. Especially information on income, prices and travel time leaves much to be desired. A final point is that the studies mentioned above specify time prices as non-monetary nuisance parameters in the utility function, implying that their coefficients reflect the marginal disutility of traveling. Becker (1965) points out that time prices should enter via the budget constraint. Dor, Gertler, and van der Gaag (1987) extend the Gertler et al. model by including time prices in the budget constraint to estimate travel time elasticities. Gertler and van der Gaag (1988) show that variation in travel time is sufficient to identify all of the parameters necessary to compute monetary price elasticities and compensating variations. We use the rest of this chapter to present this model in detail, and we will implement the model in the following chapter.

5.3 The Behavioral Model

Our framework is a model in which utility depends on health and on the consumption of goods other than medical care. If an illness is experienced, individuals decide whether or not to seek medical care. The benefit from consuming medical care is an expected improvement in health, and the cost of medical care is a reduction in the consumption of other goods and services.

Individuals have to decide not only whether to seek care, but also what type of care. They are able to choose from a finite set of alternative providers, one of which is self-treatment. Each provider offers an expected improvement in health (efficacy) for a price. Let us define the quality of an alternative provider as the expected improvement in health as a result of that provider's medical care. The price of an alternative includes both monetary outlays and private access costs such as the opportunity cost of travel time. Based on this information and their incomes, individuals choose the alternative that yields the highest utility.

Formally, let the expected utility conditional on receiving care from provider j be given by

$$U_j = U(H_j, C_j) \qquad (1)$$

where H_j is expected health status after receiving treatment from provider j, and C_j is consumption net of the cost of obtaining care from provider j.

The medical care purchased from provider j is invested in health. The quality of provider j's medical care is defined as the expected

improvement in health over the health status that an individual would enjoy if he or she treated him or herself. In essence, quality is defined as an expected marginal product. Let H_o be expected health status without professional medical care (i.e. self-treatment). Then, the quality of provider j's care is $Q_j = H_i - H_o$, which yields an expected health care production function of the form

$$H_j = Q_j + H_0. \tag{2}$$

As specified in (2), quality varies by provider, and may in fact also vary by individual characteristics such as severity of illness, and the education, age and sex of the individual.

The health production function assumes a simple form for the self-care alternative. Since $H_j = H_0$, we have $Q_0 = 0$. This implicitly normalizes the health care production function so that the quality of a particular provider's care is measured relative to the efficacy of self-care.

Consumption expenditures (net of expenditures on medical care) are derived from the budget constraint. The total price of medical care includes both the direct payment to the provider and the indirect cost of access (e.g. the opportunity cost of travel time). Let P_j^* be the total price of provider j's care and Y be income, so that the budget constraint is

$$C_j + P_j^* = Y, \tag{3}$$

with $C_j > 0$ required for the jth alternative to be feasible. Substitution of (3) into (1) for C_j yields the conditional indirect utility function

$$U_j = U(H_j, Y - P_j^*).$$

Notice that income affects utility through the consumption term, and that the price of medical care is foregone consumption.

The time spent obtaining care could, in principle, come at the expense of work in the market place, production work at home or leisure. In that case income Y and net consumptic C_j should incorporate the value of the three activities. In an economy that is only partially monetized, such as the one in rural Côte d'Ivoire, non-traded home production is a major source of income. We capture this by including the value of home production consumed by the household into the measure of income. However, adding the value of leisure would greatly complicate the model and is left for future work. Hence, we implicitly assume that lost time comes at the expense of work or home production and not at the expense of leisure. The measurement of income is discussed in Chapter VI.

We are now ready to specify the utility maximization problem. Suppose the individual has J+1 feasible alternatives (with the j=0 alternative being self-care). The unconditional utility maximization problem is

$$U^* = \max(U_0, U_1, \ldots, U_J), \tag{4}$$

wh..e U^* is maximum utility. The solution to (4) gives the alternative that is chosen, and when there are these random terms in the model, the probability that each alternative is chosen. The probability an alternative is chosen can be interpreted as the demand function in a discrete choice model. These demand functions, then, can be used to solve for the <u>unconditional</u> indirect

utility functions and the expenditures or cost functions. The unconditional functions can be used to make welfare assessments of the impact of policy changes.

In summary, individuals who experience an accident or illness are faced with a choice of obtaining treatment from one of several available providers or caring for themselves. Each alternative provider offers an expected improvement in health (quality) for a price that reduces income available for the consumption of non-medical goods. The individual chooses the provider alternative whose quality-price combination offers the highest utility, where utility is derived from health and the consumption of all goods and services other than medical care.

5.4 Empirical Specification

The solution to (4) yields a system of demand functions, whose forms are probabilities that the alternatives are chosen. The probability that a particular alternative is chosen equals the probability that this choice yields the highest utility among all the alternatives. The functional form of the demand functions depends on the functional form of the conditional utility function and the distribution of the stochastic variables.

5.4.a The Conditional Utility Function

Gertler, Locay and Sanderson (1987) show that income can influence the choice of provider only if the conditional utility function allows for a non-constant marginal rate of substitution of health for consumption. This point is easily demonstrated in the context of a two alternative example.

Suppose that the individual has the choice between self-care and doctor care, and that the conditional utility function is linear, which imposes a constant marginal rate of substitution. Thus, the utility from doctor care (denoted by subscript d) is:

$$U_d = \alpha_0 H_d + \alpha_1 (Y - P_d),$$

and the utility from self-care (subscript s) is:

$$U_s = \alpha_0 H_s + \alpha_1 Y.$$

Then, the individual chooses doctor care if

$$U_d - U_s = \alpha_0 (H_d - H_0) - \alpha_1 P_d > 0. \qquad (5)$$

If the doctor alternative is chosen the individual experiences an improvement in health of $(H_d - H_s)$ and a reduction in non-medical consumption of P_d. If the individual chooses doctor care, he or she gets an increase in utility of $\alpha_0(H_d - H_0)$ from improved health and a reduction in utility of $\alpha_1 P_d$ from reduced consumption. The decision rule in (5) says that the individual will choose doctor care if net change in utility is positive.

Equation (5) also shows that, if the marginal utility of health and the marginal utility of consumption are constant for all levels of income (i.e., if there is a constant marginal rate of substitution between health and income), then income does not contribute to which alternative is chosen. This is indicated by the fact the Y differences out of (5).

Some studies on health care provider choice try to include income in the model by specifying linear utility functions with alternative specific coefficients on income (Akin et al., 1984, 1986; Schwartz et al., 1988; Birdsall and Chuhan 1986; Dor and van der Gaag 1987; and Mwabu, 1986). This specification is inconsistent with stable utility maximiz ion. For instance, consider our earlier example with the exception that the coefficients on consumption vary by alternative:

$$U_d = \alpha_0 H_d + \alpha_{1d}(Y - P_d)$$

and

$$U_s = \alpha_0 H_0 + \alpha_{1s} Y.$$

Notice that the marginal utility of consumption is constant but varies by alternative. In this case, doctor care is chosen if

$$U_d - U_s = \alpha_0(H_d - H_s) - \alpha_{1d}P_d + (\alpha_{1d} - \alpha_{1s})Y > 0.$$

In this specification income does not difference out of the decision rule and therefore influences the choice. The identifying restriction, though, is that the coefficient on consumption must be different in the two alternatives. In other words, the marginal utility of consumption must be different for the two alternatives even when evaluated at the same level of consumption. This implies that two alternatives that provide the same health for the same price must yield different levels of utility to the same individual. If this is true, then preferences are not ordered and transitive, and therefore stable utility functions do not exist.

Alternatively, if the functional form does not impose a constant marginal rate of substitutional on the conditional utility function then income will influence the choice. To make this point we generalize the above example so that the decision rule in (5) is:

$$U_d - U_s = U(H_d, Y-P_d) - U(H_0, Y)$$

The income effect is found by the partial derivative

$$\frac{\partial(U_d - U_s)}{\partial Y} = \frac{\partial U(H_d, Y-P_d)}{\partial C} - \frac{\partial U(H_0, Y)}{\partial C} \qquad (6)$$

If the derivative of the conditional utility function with respect to consumption, $\partial U/\partial C$, is constant (i.e. $\partial^2 U/\partial C^2$ and $\partial^2 U/\partial C \partial H$ are zero), then (6) is zero and income does not influence the choice. When $\partial U/\partial C$ is non-constant, (6) is non-zero and income does influence the choice. Also the marginal rate of substitution, $-(\partial U/\partial H)/(\partial U/\partial C)$, is non-constant when $\partial U/\partial C$ is non-constant.

Another implication of the model is that if health is a normal good, the effect of price is smaller for larger incomes. This point requires the reasonable assumption that $\partial U^2/\partial C \partial H \geq 0$, (i.e., that the marginal utility of consumption increases with improved health). For health to be a normal good (6) must be positive. For (6) to be positive, $\partial^2 U/\partial C^2$ must be negative, i.e. the conditional utility function must be concave in consumption. Now we use this information to show that the effect of price diminishes with increases in income. The price effect from (8) is:

$$\frac{\partial(U_d - U_s)}{\partial P} = - \frac{\partial U(H_d, Y-P_d)}{\partial C}$$

Thus, an increase in income influences the price effect by

$$\frac{\partial^2(U_d - U_s)}{\partial P \partial Y} = - \frac{\partial U^2(H_d, Y-P_d)}{\partial C^2}.$$

Hence, an increase in income reduces the negative effect of price if $\partial^2 U/\partial C^2$ is negative. Therefore, if health is normal good (i.e. $\partial^2 U/\partial C^2 < 0$), the effect of price on the choice diminishes with income.

This point can be made in a more intuitive context. If health is a normal good, then the demand for health increases with income. A necessary condition for normality is that as income rises, the marginal rate of substitution of consumption for health diminishes, holding health constant. This point is demonstrated in Figure 1. where the continuous choice case wit health being a normal good is pictured. As income rises the point of utilit maximization moves out from the origin along the expansion path. Holding health constant at $\bar{H}$, we move to the right along the horizontal line as incor rises, intersecting the indifference curves at points of flatter slopes, implying a diminishing marginal rate of substitution.

In a discrete choice situation, normality implies that as income rises individuals are more likely to choose the 'higher price/higher quality' options. Here as well, a necessary condition for normality is that as income rises, the marginal rate of substitution of consumption for health diminishes holding health constant. This is demonstrated in Fig. 2, where the discrete choice case with health as a normal good is pictured. In Fig. 2, there is a choice between a 'high price/high quality' option (P_h, Q_h), and a 'low

price/low quality' option (P_ℓ, Q_ℓ). At a low income level, say Y_ℓ, the choice is between points A and B, i.e., between a gain in health of ($H_h - H_\ell$) and a gain in consumption of ($P_h - P_\ell$). At income Y_ℓ, the additional consumption is preferred to the additional health and the 'low price/low quality' option B is chosen. The high income individual with income Y_h has a choice between points C and D. These points represent the same tradeoff between health and consumption as points A and B. As income rises the marginal rate of substitution of consumption for health falls along both horizontal lines H_h and H_ℓ. Eventually, at some income between Y_ℓ and Y_h, the gain in health is preferred to the gain in consumption. At income Y_h, the 'high price/high quality' option C is chosen.

In summary, if health is a normal good, then higher income individuals will choose the high quality/high price option and lower income individuals will choose the low quality/low price option, <u>ceteris paribus</u>. In other words, the price difference dissuaded low income individuals from choosing the high quality/high price option, but it did not dissuade high income individuals. What matters in the choice is the budget share of medical care. For low income individuals the high quality/high price option represents a significant portion of their budget. Rather than give up, say, food, they choose the low quality/low cost option. Alternatively, the high quality/high price option is a small portion of high income individuals budgets implying that they don't have to give up much to choose it. Finally, to allow health to be a normal good and therefore allow income to influence the choice, the functional form of the conditional utility function should not impose constant marginal rate of substitution. Whether or not health is a

Figure 1: The Trade-Off between Health and Consumption

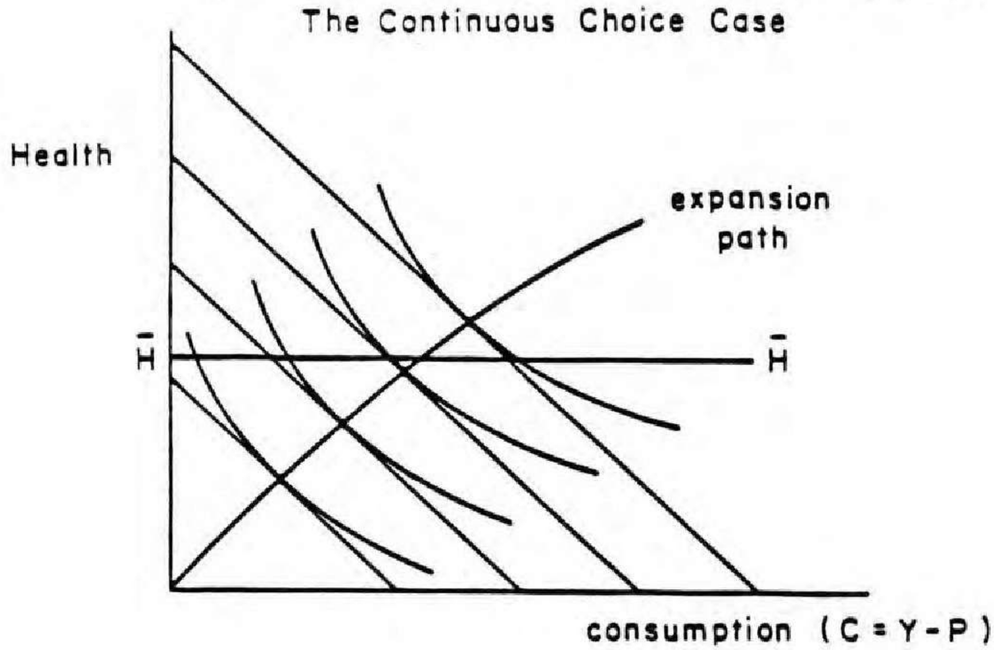
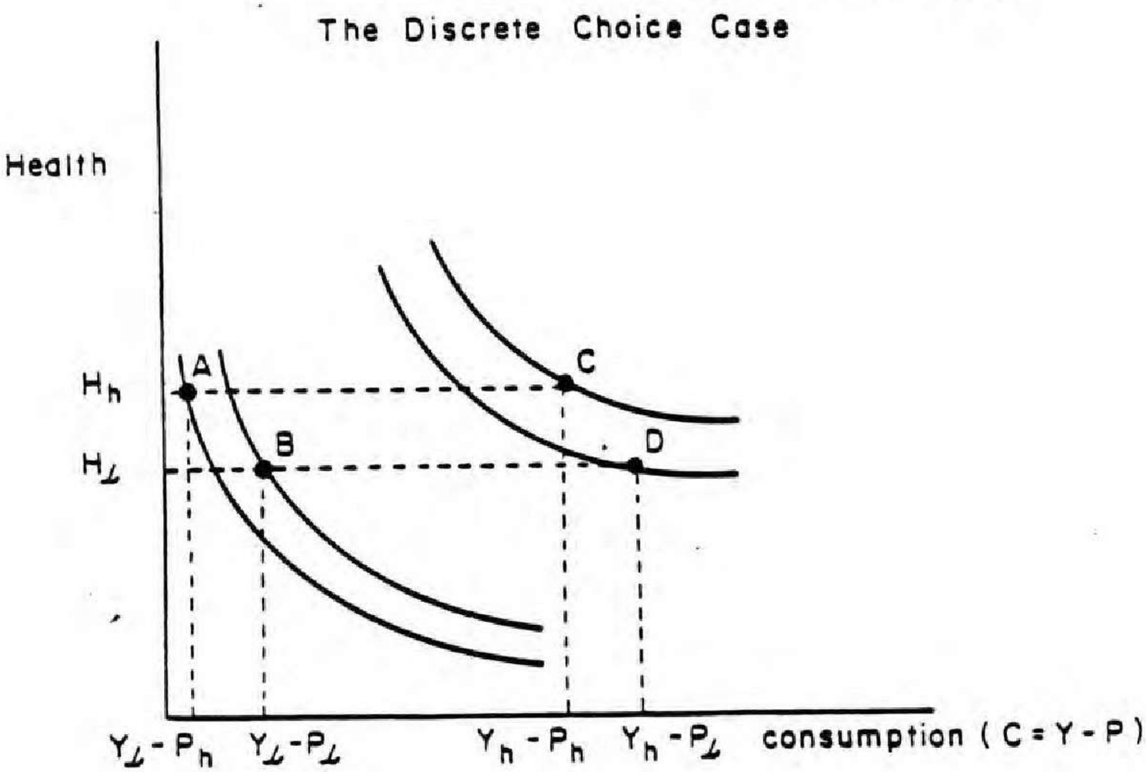


Figure 2: The Trade-Off between Health and Consumption



normal good is an empirical question, and the functional form should be flexible enough for the data to answer this question.

A parsimonious functional form for the conditional utility function that does not impose a constant marginal rate of substitution and is consistent with stable utility maximization, is the semi-quadratic, which is linear in health and quadratic in consumption. Specifically, let the conditional utility function be

$$U_j = \alpha_0 H_j + \alpha_1 C_j + \alpha_2 C_j^2 + \varepsilon_j \tag{8}$$

where ε_j is a zero mean random taste disturbance with finite variance and is uncorrelated across individuals and alternatives.

Consumption (i.e. income net of the cost of obtaining care from provider j) is derived from the budget constraint in (3). Specifically, $C_j = Y - P_j^*$. The full price of medical care is the direct payment to the provider plus the value of time spent in obtaining the care. Consumption, then, is

$$C_j = Y - (P_j + wT_j) \tag{9}$$

where P_j is the direct payment to provider j, w is the opportunity cost of time, and T_j is the time spent obtaining care from provider j. Substitution of (9) into (8) yields

$$U_j = \alpha_0 H_j + \alpha_1 (Y - (P_j + wT_j)) + \alpha_2 (Y - (P_j + wT_j))^2 + \varepsilon_j \tag{10}$$

Since $P_0 = H_0 = 0$, the conditional utility function for the self-care alternative

$$U_0 = \alpha_0 H_0 + \alpha_1 Y + \alpha_2 Y^2 + \varepsilon_0. \tag{11}$$

The identification of the parameters in (10) and (11) requires that the values of expected health and consumption differ across the alternatives. The alternative chosen is the one that yields the highest utility. Therefore, if the contribution of either expected health or consumption to utility is constant across alternatives they cannot influence which alternative is chosen. Attributes that are constant across alternatives are differenced out of the decision rule. This implies that it is variation in prices across alternatives that identifies α_1 and α_2. If prices did not vary across alternatives, then consumption would be constant across alternatives and difference out of the decision rule.

At this point it is easy to show that all of the parameters can still be identified if monetary prices are zero. The identification of α_1 and α_2 in (10) and (11) require variation in prices and/or travel time across alternatives so that the contribution of consumption varies across alternatives. Hence, variation in T_j across alternatives suffices to identify these parameters.

5.4.b Quality

The remaining issue in the specification of the conditional utility function is the measurement of the expected efficacy (quality) of each

alternative. Substitution of the health production function (2) into the conditional utility function (10) yields

$$U_j = \alpha_0 H_j + \alpha_0 Q_j + \alpha_1 (Y - P_j - wT_j) + \alpha_2 (Y - P_j + wT_j)^2 + \varepsilon_j. \qquad (12)$$

Since $Q_0 = 0$, the conditional utility function in (13) for the self-care alternative reduces to

$$U_0 = \alpha_0 H_0 + \alpha_1 Y + \alpha_2 Y^2 + \varepsilon_0. \qquad (13)$$

The $\alpha_0 H_0$ term appears in all the conditional utility functions, and its value is constant across alternatives. Since only differences in utility matter, these terms can be ignored.

Estimation is complicated by the problem that quality is unobserved, in the nonself-care conditional utility functions in (12). We solve this problem by letting Q_j be a parametric function of its observable determinants. The expected quality of provider j's care is the expected improvement in health (marginal product) over the expected level of health that would occur from self-treatment. The expected improvement in health can be viewed as being produced through a household production function. The arguments of the household production function are provider characteristics, and individual characteristics such as severity of illness and ability to implement the recommended treatment plan. For example, the expected improvement in health from hospital care relative to self-care may be increasing in education, since individuals with higher education may be better able to implement recommended treatment plans.

Moreover, the marginal utility of an individual's health may also vary with household characteristics. For example, the marginal utility of the health of a child may depend on how many children there are in the household. In general, the value of health may vary with many demographic variables such as age, sex, education, and family composition.

The basic determinants of both the quality household production function and the marginal utility of quality are demographic variables. Pollak and Wachter (1975) argue that the separate effects of demographic variables in the household production function and in the marginal utility of quality cannot be identified separately. Therefore, we specify a reduced form model that shows how utility is derived from quality. Formally, let this function be given by

$$\alpha_0 Q_j = \beta_{0j} + \beta_{1j} X + \eta_j, \tag{14}$$

where X is a vector of the determinants of quality and utility from quality, and η_j is a zero mean random disturbance with finite variance.

To make the specification as general as possible, we let the coefficients in (14) vary by alternative. Allowing for different intercepts permits the baseline quality to vary by alternative, and having different slope coefficients allows the provider's productivity relative to self-care to vary with individual characteristics such as age, education, and severity of illness. The random disturbance term captures unmeasured portions of the quality function. These disturbances may be correlated across alternatives.

Since $Q_0 = 0$, the utility from quality function simplifies to $\alpha_0 Q_0 = 0$ for the self-care alternative. Hence, the coefficients in (14) are interpreted relative to the self-care alternative. Notice further that the normalization sets the unobserved portion of quality in the self-care alternative, η_0, equal to zero as well.

Substitution of (14) into the conditional utility functions in (12) and ignoring the $\alpha_0 H_0$ term that appears in all the conditional utility functions, gives us

$$U_j = V_j + \eta_j + \varepsilon_j, \tag{15}$$

where

$$V_j = \beta_{0j} + \beta_{1j} X + \alpha_1 (Y - P_j - wT_j) + \alpha_2 (Y - P_j + wT_j)^2 \tag{16}$$

This completes the specification of the indirect conditional utility functions. Notice that the intercept and coefficients on the demographic variables vary by alternative, whereas the coefficients on the economic variables are constant across alternatives. Further, the disturbances in the nonself-care conditional utility functions are correlated with each other but, since $Q_0 = 0$, they are uncorrelated with the disturbance in the self-care conditional utility function.

5.4.c <u>The Demand Functions and Welfare</u>

The demand function for a provider is the probability that the utility from that alternative is higher than the utility from any of the other alternative. Most of the previous studies on the demand for medical care in

developing countries have assumed that these demand functions take on a multinominal logit (MNL) form. As discussed in McFadden (1981), the MNL suffers from the Independence of Irrelevant Alternatives assumption. This assumption is equivalent to assuming that stochastic portions of the conditional utility functions are uncorrelated across alternatives, and imposes the restriction that the cross-price elasticities are the same across all alternatives. A computationally feasible generalization of the MNL is the Nested Multinominal Logit (NMNL), which was introduced in McFadden (1981). The NMNL allows for correlation across sub-groups of alternatives and, therefore, non-constant cross-price elasticities. The NMNL allows the grouping of more similar alternatives (i.e. closer substitutes) so that the cross-price elasticities are more elastic within groups than across groups. The NMNL also provides a specification test for groupings. Further, the NMNL is a generalization of the MNL as the MNL is "nested" within it. This provides us with a specification test.

The NMNL specification for our problem is as follows. Following McFadden (1981), we assume that the joint distribution of the η_i's and ε_i is a type B extreme value distribution. Let choice 0 be the self-care alternative, and choice 1,..., J be the various provider alternatives. The η_j's imply that the error terms of the provider alternatives may be correlated with each other, but not with the self-care alternative. Therefore, the self-care demand function (i.e. the probability of choosing self-care) is

$$\Pi_0 = \frac{\exp(V_0)}{\exp(V_0) + \left[\sum_{j=1}^{J} \exp(V_j/\sigma)\right]\sigma}$$

and the demand for provider i is:

$$\Pi_i = (1 - \Pi_0)\left[\frac{\exp(V_i/\sigma)}{\sum_{j=1}^{J} \exp(V_j/\sigma)}\right]$$

where σ is one minus the correlation between the error terms of the providers conditional, utility functions introduced by the η_j's.

The log likelihood function for this problem is simply

$$\ln L_i = \sum_{j=0}^{J} D_{ij} \ln \Pi_{ij}$$

where D_{ij} is a dichotomous variable that takes on the value one if individual i chose alternative j. Although a two step estimate exists (McFadden, 1981), we will employ full information maximum likelihood to estimate the model. Hensher (1986) shows that full information maximum likelihood estimation of NMNL yields substantial efficiency gains over the more popular two-step procedure.

McFadden (1981) shows that σ must be between zero and one for the model to be consistent with utility maximization. When σ is close to zero, the error terms in the provider alternatives' conditional utility functions are highly correlated. This implies that individual views providers as closer substitutes with each other than any with self-care. In terms of cross-price elasticities, this implies that a provider's demand is more sensitive to another provider's change in price than is self-care demand. Thus, if σ is

less than one, an increase in one provider's price will cause a greater percentage increase in other providers' demands than in self-care.

Finally, as mentioned above, the MNL is a special case of the NMNL. Specifically, when $\sigma = 1$, the NMNL reduces to an MNL. In this case the error terms are uncorrelated and the self-care alternative and the providers are viewed as equally close substitutes for one another. Moreover, the cross-price elasticities are constant across alternatives. This condition provides a formal specification test of the MNL.

The estimated demand functions can be used to project the impact of user fees on demand and revenues, and on the number of people who do not seek health care as a result of user fees. These demand functions also form the basis of our measurement of the willingness to pay for reduced travel time to a medical care facility. The willingness-to-pay measure is calculated as a compensating variation, which is the amount of income that an individual must be compensated to make him or her just as well off after a price change as before the change. The effect of a price change on welfare involves both an income effect (reduction in Y-P) and a substitution effect (changes in the probabilities that the alternatives are chosen). Both must be taken into account in the compensating variation calculation. The calculation involves solving the demand functions to obtain the <u>unconditional</u> indirect utility and expenditure functions with which compensating variation experiments can be conducted. Small and Rosen (1981) provide the general theory for discrete choice demand systems. Consider changing the vector of provider travel times from T to T'. In the case of a nested multinominal logit, the compensating variation, CV, i.e., the amount of income that an individual must be given or is willing to forego to make him as well off at T' as he or she was at T is

$$CV = (1/\lambda)\{\ln[\exp(V_0) + [\sum_{j=1}^{J} \exp(V_j/\sigma)]^{\sigma}]$$

$$- \ln[\exp(V_0') + [\sum_{j=1}^{J} \exp(V_j'/\sigma)]^{\sigma}]\} \qquad (17)$$

where V_j and V_j' are evaluated at T and T', respectively, and where λ is the marginal utility of income.

In order for (17) to be exact, the marginal utility of income λ must be independent of alternative specific characteristics and price (McFadden, 1981; Small and Rosen 1981) Although λ is independent of quality, it is not independent of price. Specifically

$$\lambda = \partial U/\partial Y = \alpha_1 + 2\alpha_2(Y - P).$$

Since the prices are very small relative to income, λ is likely to be approximately constant across small differences in price. Hence, each individual's average marginal utility of income over the alternatives is a good approximation of λ. Although this is little variation in λ for an individual across alternatives, λ may vary greatly across individuals as there is substantial variation in income.

5.5. Summary

In this chapter we first drew attention to an apparent parodox in the health economic literature: price elasticities in developing countries are

reported to be lower than in the developed world. We presented various reasons why the opposite could be expected. We also discussed some of the theoretical and empirical shortcomings in the literature on the demand for health-care in developing countries.

Based on this discussion, we derived a fairly general and flexible model of the demand for medical care that has the following attractive properties:

1. It is consistent with utility maximization which allows us to use the derived demand functions for welfare analysis.

2. It is flexible. In particular, the effect of price on the demand for medical care is allowed to differ by income level.

3. It is empirically tractable.

These properties allow us the answer the main empirical question of this study: how price elastic is the demand for medical care. We will do so in the next chapter.

CHAPTER 6

Estimation and Results

6.1 Introduction

In this chapter we describe the estimation of the model of medical care provider choice developed in the previous chapter. The main purpose of the estimation is to obtain price elasticities of demand so as to be able to investigate the cost recovery, utilization, and welfare implications of various user fee policies. The estimation results for both countries and for all age groups show that prices are important determinants of medical care utilization. Moreover, as expected, we find that the price elasticity of demand falls with income. Demand is in the elastic range for the lowest income groups, while it is inelastic in the upper income groups. These results imply that user fees can generate substantial revenue without much affect on the utilization by individuals in the upper income groups, but may cause large reductions in utilization by individuals in the lower income groups.

The policy and overall welfare implications of these results will be explored in detail in the next chapter. In this chapter we describe the data and the estimation results. The chapter is subdivided into sections on Côte d'Ivoire and Peru, respectively. We begin by discussing the relevant provider choices available within the institutional structure of each country, and the measurement of the variables that are used in the estimation. Subsequently, we present the estimated coefficients and price elasticities.

The models are estimated with data from the 1985 Côte d'Ivoire Living Standards Survey (CLSS) and the 1985 Peruvian Living Standards Survey

(PLSS). These identical multipurpose household surveys were aimed at measuring socio-economic factors relevant to the standard of living of the respective populations. The surveys collected detailed information on individuals' illnesses and medical care utilization over the four weeks immediately prior to the interview, in addition to many socio-economic variables relevant to medical care demand such as income, family structure, and education. A useful feature of the Living Standards Surveys is that they also collected community level information in rural areas. For each village, information on travel time to the nearest available medical facility of every type, and village level male and female agriculture wage rates were collected.

To ensure flexibility in the empirical specification, separate models are estimated for children and adults in both countries. All of the models are estimated by full information maximum likelihood.

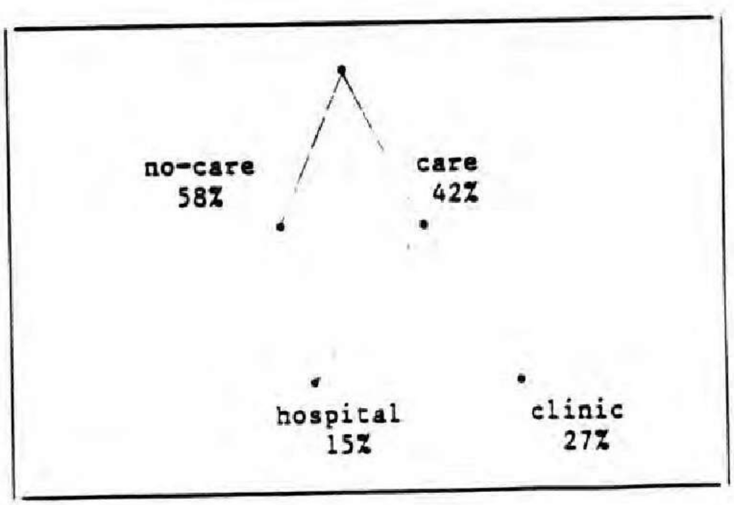
In the appendix to this chapter, we report the estimation results of the misspecified model used in earlier work (Akin et al., 1984, 1986; Birdsall and Chuhan, 1986; Dor and van der Gaag, 1987; Mwabu, 1986; and Schwartz et al., 1988). These results also indicate that prices are statistically significant determinants of medical provider choice. Since, as pointed out in the previous chapter, these models are inconsistent with utility mazimization, the results cannot be interpreted structurally. Therefore, the estimates are not representative of demand function parameters, but rather of reduced form correlations.

6.2 Côte d'Ivoire

6.2.a Institutions and Measurement of Variables

In rural Côte d'Ivoire, almost no private health care is available and few people report using it. The vast majority of individuals who experience an illness or accident seek care from either a government hospital or clinic, or do not obtain any professional medical treatment at all. Traditional healers do exist, but less than 3% of the report obtaining traditional care. Therefore, we leave them out of the analysis. Finally, only a handful of people in rural areas travel the very long distance to an urban area to go to a private doctor or to a pharmacy. Given this information, the relevant medical care alternatives for residents of rural Côte d'Ivoire appear to be government hospitals, government clinics, and self-care. The distribution of health-care provides choices in our sample as given in Figure 1. Of the 42% of individuals who seek professional medical care for an illness, about 2/3 go to clinics and 1/3 to hospital outpatient centers.

FIGURE 1.: **Health-care Provider Choice**
Rural Côte d'Ivoire, Total Population



It is this split of the sample (those who do not seek care, those who go to a hospital clinic and those who visit a clinic) that we try to explain with our theoretical model. For ease of reference, we repeat this model here. Let Π_j be the probability that an individual chooses alternative j, with j=0 being the self-care alternative. Then

$$\Pi_0 = \frac{\exp(V_0)}{\exp(V_0) + [\sum_{j=1}^{J} \exp(V_j/\sigma)]^\sigma}$$

and
$$\Pi_i = (1-\pi_0) \left[\frac{\exp(V_i/\sigma)}{\sum_{j=1}^{J} \exp(V_j/\sigma)}\right]^\sigma$$

where σ is one minus the correlation between the error terms of the provider alternatives (self-care excluded). Thus the model is specified as a Nested Multi-Nomial Logit model that collapses into a Multi-Nomial Logit model if we find that σ = 1.00. The term V_j represents the utility derived from alternative j, and is parameterized as

$$V_j = \beta_{0j} + \beta_{1j}X + \alpha_1(Y - P_j - wT_j) + \alpha_2(Y - P_j - wT_j)^2$$

where X is a vector of socio-economic variables

Y is total income

P_j is the fee for provider j

w is the opportunity cost of time, and

T_j is the travel time to provider j.

The term $(Y - P_j - wT_j)$, which enters both in linear and quadratic form, shows the effects of income and prices (both monetary and non-monetary) on the demand for medical care. The vector X includes variables such as age, sex, and education, that may influence the efficacy of obtaining care from a specific provider as well as the value (utility) the individual (or household) puts on an increase in health status.

As specified in the theoretical model, an alternative that yields the highest utility is chosen, where utility depends on the expected quality (improvement in health) and on consumption net of medical care. The expected quality and consumption net of medical care must be specified for each option.

Consumption net of medical care is income less the cost of obtaining medical care. Income is calculated as the average monthly value of total household consumption. Household consumption is a better measure of permanent income than reported income because it is less sensitive to temporary fluctuations (e.g. seasonality of work) and because it includes the value of home production. In developing countries such as Côte d'Ivoire and Peru, non-market activities such as home production are major sources of income. In Côte d'Ivoire the value of home-grown produce consumed by the household amounts to approximately half the food budget and one third of total consumption. Purchasing medical care not only reduces the monetary resources available for other consumption, but also reduces time available for home production and other work.

Since the government facilities had no user fees in 1985, the price of care was the opportunity cost of time spent in obtaining care. Recall from the theory chapter that variation in travel time is sufficient to identify all the parameters of the demand functions, thus allowing calculation of price

elasticities and willingness-to-pay measures. The opportunity cost of time is calculated as the product of the round-trip travel time and the individual's wage rate. For children, the opportunity cost of the mother's time is used. The round trip travel time for each individual to each alternative comes from the community survey, and the appropriate village male or female agricultural wage rate is taken as the unit opportunity cost of time.

The male and female village agricultural wage rates are reasonable estimates of the opportunity cost of time. Newman (1987) shows that 93% of all working adults in rural areas of Côte d'Ivoire are engaged in agricultural activities. Moreover individual variation in wage rates within village is likely to be small since over 90% of the adults have less than one year of schooling.

The utility derived from an expected increase in health status is specified to be a function of the option chosen and individual characteristics. The arguments of the alternative specific functions are individual and family characteristics that may affect quality and the marginal utility of quality. Variables that may influence the efficacy of medical care include age, the number of healthy days last month, education, the number of other adults in the household, and the number of children in the household. Age and the number of healthy days proxy for health status. Age is entered in spline form with the break occurring at 40 years old for adults and at 3 for children. The break points were determined by grid searches, which involve finding the break points that maximize the likelihood function. Education (years of schooling) is included since more educated individuals may be better able to implement recommended treatments and therefore produce more health relative to self-care than can less educated individuals. In the case of

children the mother's education is used. The family composition variables are included because the more adults and fewer children there are in the household, the better able a household may be at self-treating an illness. Variables that may affect the marginal utility of quality include age, sex and household composition.

Since the vast majority of individuals living in rural Côte d'Ivoire are farmers (97%), the sample used for estimation excluded non-farm households. The sample also excluded households in villages for which the community informatic as not available. In order to focus on primary medical care, visits for ob ric and other preventive purposes were excluded. There were 19 such cases. e exclusion of villages without community level data reduced the sample by 8%. The final sample included 49 villages, with observations of 1030 adults and 769 children under age 16 who experienced an accident or illness in the four weeks prior to the survey.

Descriptive statistics are presented in Table 1. We see that 24% of the adults and 30% of the children who report an illness or injury visit a clinic, while 15% of adults and 14% of children obtain outpatient hospital care. It is noteworthy that the average travel time is about an hour to clinics and about an hour and three quarters to a hospital.

TABLE 1. Descriptive Statistics - Côte d'Ivoire

	Adults		Children	
Variables	Mean	Standard Deviation	Mean	Standard Deviation
Clinic [a]	0.24	(0.49)	0.30	(0.55)
Hospital [a]	0.15	(0.38)	0.14	(0.37)
Clinic Travel Time [b]	1.18	(1.32)	0.92	(1.16)
Hospital Travel Time [b]	1.90	(.92)	1.56	(1.60)
Monthly Family Income [c]	97.85	(81.19)	108.41	(99.66)
Hourly Wage [d]	75.48	(28.54)	74.89	(26.42)
Age	44.85	(17.12)	6.33	(3.64)
Male	0.46	(0.50)	0.51	(0.50)
Education	0.85	(2.16)	0.91	(2.88)
Healthy Days	18.60	(9.94)	22.34	(7.24)
Number of Adults	4.57	(2.96)	4.62	(3.01)
Number of Children	4.86	(2.44)	4.97	(2.77)
Sample Size	1030		769	

a/ Binary variables; equals one if alternative is chosen and zero otherwise.

b/ Round trip travel time; reported in hours.

c/ Calculated as total household consumption and reported in thousands of 1985 Ivorian CFA's. In 1985, the exchange rate was approximately 461 CFA per U.S. dollar.

d/ Reported in 1985 Ivorian CFA's.

6.2.b **Estimation Results**

The nested-multi-nomial logit (NMNL) models of provider choice in rural Côte d'Ivoire were estimated by full information maximum likelihood. One model was estimated for the adults and another for children. The results are presented in Table 2, and are generally consistent with economic theory.

The estimated value of σ is .34 for adults and .41 for children. The estimates are both significantly different from zero and significantly different from one. Therefore, the models are both consistent with utility maximization and reject the MNL specification in favor of the NMNL. The result that σ is less than one also implies that hospital and clinic care are closer substitutes than hospital and self-care or clinic and self-care.

In both the adults' and children's models the coefficients on the consumption and/or its square are significantly different from zero. The signs of the coefficients indicate that the conditional utility function is concave in consumption. In other words, the marginal utility of consumption is diminishing, but does not become negative in the relevant range. Prices enter the model via the consumption terms. As shown in Chapter V, if the prices did not vary across alternatives, the coefficients on consumption would not be identified as the value of consumption would then be constant across alternatives. The fact that these coefficients are significant implies that the relative prices of the alternatives are relevant to the choice of the provider. Prices and income enter the model in a highly non-linear fashion through the consumption terms, making it hard to judge the order of magnitude of their effects. Therefore, we will examine them in detail in the next

section. This section is devoted to discussing the effects of the other variables. We begin with the adults and then consider children.

Unlike in developed countries, adults in rural Côte d'Ivoire seem to reduce medical care utilization over the life cycle, ceteris paribus. The coefficients on the first age spline indicates that individuals between the ages of 16 and 40 are equally likely to seek medical care for the treatment of an accident or illness. After age forty, though, the demand for both hospital care and clinic care falls with age.

TABLE 2: The Multi-Nomial Logit Model of Provider Choice Estimates - for Côte d'Ivoire

Variable	Adults		Children	
	Coefficient	t-Statistic	Coefficient	t-Statistic
Consumption*	10.04	(5.44)	14.43	(5.65)
Consumption** squared	-0.02	(3.30)	-0.01	(2.14)
Sigma	0.34	(3.54)	0.41	(4.37)
Hospital				
Constant	1.64	(1.20)	2.68	(2.54)
Age 1	-0.00	(0.11)	-0.69	(2.31)
Age 2	-0.10	(2.82)	-0.04	(0.64)
Education	-0.05	(0.45)	-0.05	(0.13)
Male	0.73	(1.68)	0.05	(0.13)
Children	0.17	(2.17)	0.21	(2.44)
Adults	-0.15	(1.69)	-0.19	(2.06)
Healthy Days	-0.13	(3.32)	-0.09	(2.71)
Clinic				
Constant	0.69	(0.51)	2.50	(2.51)
Age 1	0.02	(0.66)	-0.64	(2.40)
Age 2	-0.10	(2.60)	0.04	(0.76)
Education	-0.03	(0.31)	0.00	(0.50)
Male	-0.07	(0.16)	0.17	(0.46)
Children	0.15	(1.89)	0.18	(2.28)
Adults	-0.15	(1.78)	-0.21	(2.30)
Healthy Days	-0.10	(2.45)	-0.06	(2.05)
Sample Size	1030		769	
Log Likelihood	-886		-679	

One explanation for this unusual pattern of medical care utilization over the life cycle may be derived from human capital theory. Families may prefer to invest scarce resources in the health of members for whom the return is higher. For the same improvement in health, the economic return, in terms of family income, is higher from investing in the health of younger more productive members than from investing in the elderly. A second reason may be that the available medical care in rural Côte d'Ivoire is best suited for helping the acute health problems common to prime age adults rather than the more complex chronic problems of the aged. Hence the available medical care is less productive (efficacious) in treating the elderly than in treating prime age adults, resulting in lower utilization rates of the latter.

Again unlike in developed countries, education does not seem to effect provider choice or the decision to seek formal care. The negligible education effect is most likely to result from the small variation in education in the Ivorian sample. The average years of schooling is less than one year. Therefore, the estimated coefficient is probably not a true measure of the influence of education on medical care utilization.

We find that males who experience an accident or illness are more likely to seek care, and in particular hospital care, than are females. This is again consistent with the theory of investing in the more productive household members, or at least in household members that are considered to be more productive. It could also be a sign of gender bias that warrants more scrutiny than can be given within the scope of this study. Finally, the types

of illnesses males experience may be better treated within the current Ivorian health-care infrastructure than the types of illnesses females experience.

The coefficients on the family structure variables indicate the individuals in the households with fewer adults and more children are more likely to seek both hospital and clinic care. This is consistent with the hypothesis that having more adults in the household allows more time to better care for sick individuals at home, and having more children results in having less time to take of the ill.

Finally, and not surprisingly, severity of illness, as indicated by the number of healthy days, substantially reduces the probability of an adult seeking medical care, but it does not affect which alternative is chosen. This finding is common to almost all studies of medical care utilization in both the developed and developing world. One caveat is that the number of days an individual was healthy may be endogenous in a model of medical care demand. To ensure the robustness of our price and income effects, we reestimated the model on both adult and children samples without including the healthy days variable. There was no difference in the estimated coefficients on the other variables.

The results from the model for children are similar to those for adults. The pattern of medical care utilization through childhood is described by the coefficients on the age splines. They show that demand falls with age from zero to three years old and is flat thereafter. In other words, that infants who experience an accident or illness are more likely to seek medical care than older childrcn, and more likely to seek the higher quality hospital care over clinic care.

As in the adult model, mother's education does not influence provider choice, and again we attribute this to the lack of variation in the data rather than interpret it as a true education effect. Unlike the adult model, though, there are no differences by sex. Again as in the adult model, severity of illness increases the demand for medical care, the number of adults in the household has a negative effect on the probability of going to both clinics and hospitals, while the number of children has positive effects.

6.2.c Price Elasticities

Since prices and income enter the demand functions in a highly non-linear fashions, it is hard to assess the direction and magnitude of their effects on demand directly from the estimation results in Table 2. To facilitate this, we estimate arc price elasticities of the demand for clinic and hospital care by income quartiles. The arc elasticities are obtained by sample enumeration (Train, 1986) within each income quartile. More specifically, the probability of an individual choosing an alternative at the bottom and top of the price range we consider, is predicted for every individual in the income group. Only the price of the alternative being considered is changed for these calculations. In order to hold constant all characteristics except for price and income, each individual was assigned other characteristics equal to the sample mean. Thus, within an income group, only the price varies, and within a price range, only income varies. The arc price elasticity is then constructed by dividing the average percentage change in the sum of the probabilities, by the average percentage change in the

price. Thus an arc price elasticity of, say, -.50 implies that a 10% increase in price will result in a 5% reduction in demand.

Arc price elasticities of the demand for clinic care and the demand for hospital care were calculated for three ranges of CFA 50 each, ranging from free care to a fee of CFA 150. These are within-sample calculations as the opportunity cost of time averages about 100. The arc price elasticities for adults are presented in Table 3 and for children in Table 4. Reading down a column of Table 3 or 4 shows the change in the price elasticity moving down the demand curve, holding income constant. Reading across a row of Table 3 or 4 reflects the change in the price elasticity as income rises, holding price constant.

The results show that the price elasticity of demand falls with income. Indeed, adults' and childrens' demand for both clinic and hospital care is vastly more elastic at lower income levels than at the top of the income distribution. Clinic and hospital demand of both adults and children in the bottom three-quarters of the income distribution is in the price elastic region, whereas demand from those in the top income quartile is well into the inelastic region. In addition, childrens' demand for both clinic and hospital care is more price elastic than is adults' demand. The difference is smaller in the lower income groups, but is substantial in the highest income group. These results indicate that user fees will be regressive in the sense that they reduce medical care utilization by the poor substantially more than by the rich. Furthermore, user fees will reduce the utilization of medical care by children more than they will reduce utilization by adults. On the other hand, user fees can generate substantial revenues without adverse utilization effects in relatively better-off communities. We will come back to these implications in Chapter VII.

TABLE 3: ARC Price Elasticities by Income Quartile
Côte d'Ivoire; Adults

Range of Fees*	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)
Clinic				
0-50	-0.61	-0.58	-0.53	-0.38
50-100	-1.16	-0.40	-0.19	-0.05
100-150	-1.83	-1.71	-1.57	-0.93
Hospital				
0-50	-0.47	-0.44	-0.41	-0.29
50-100	-0.86	-0.81	-0.76	-0.51
100-150	-1.34	-1.27	-1.18	-0.71
Mean Income **	33.28	64.44	99.52	222.87

* Measured in Ivorian CFA.
** Measured in thousands of Ivorian CFA per month.

TABLE 4: ARC Price Elasticities by Income Quartile
Côte d'Ivoire; Children

Range of Fees*	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)
Clinic				
0-50	-0.90	-0.80	-0.67	-0.31
50-100	-1.81	-1.56	-1.29	-0.51
100-150	-2.82	-2.43	-1.98	-0.66
Hospital				
0-50	-0.65	-0.58	-0.49	-0.12
50-100	-1.34	-1.17	-0.98	-0.20
100-150	-2.32	-1.98	-1.60	-0.48
Mean Income **	33.28	64.44	99.52	222.87

* Measured in Ivorian CFA.
** Measured in thousands of Ivorian CFA per month.

Implicit in the calculations of these price elasticities are the effects of travel time on utilization, working through the opportunity cost of time. To explicitly investigate the rationing effects of facility location, we calculate travel time elasticities. In order to estimate how travel time affects demand across income groups we need to allow wage rates (the opportunity cost of time) as well as income to vary across the income quartiles. We use the agricultural wage rate associated with each income quartile for these calculations.

Arc travel time elasticities of the demand for clinic care and the demand for hospital care were calculated for four ranges of one hour each, covering 0 to 4 hours. They are presented in Table 5 for adults and in Table 6 for children. Reading down a column of Table 5 or 6 reflects the change in the time elasticity for increasing travel time, holding income constant. Reading across a row of Table 5 or 6 reflects the change in the time elasticity as income rises, holding time constant.

The magnitude of the travel time elasticity estimates are very similar to the price elasticity estimates. This is not surprising since the opportunity cost of time is currently the whole price of medical care in Côte d'Ivoire, thus time prices ration the market. The elasticity estimates show individuals in the bottom 3/4 of the income distribution to be much more sensitive to the opportunity cost of time than richer individuals in the top quarter. Moreover, children's medical care utilization is more sensitive to time than adults' utilization in the higher income groups, but not for the lower income groups. One interesting result is that demand becomes slightly more time elastic as income rises over the bottom three income quartiles.

This reflects the increase in wage rates (i.e. the opportunity cost of time) over these income groups.

These results imply that the opportunity cost of time is a bigger access barrier for poorer individuals than it is for richer individuals. Poorer individuals can less afford to loose productive time than can the rich. The lower income groups in our sample consist of subsistence farmers who obtain a good portion of their income in the form of self-produced food. Moreover, little income is available to purchase processed goods which in turn implies that many hours must be spent in home production activities such as gathering wood and fetching water. Our results clearly underscore that poor people are not just money-poor, they are also time-poor. Therefore, increasing the supply of health-care facilities in poor areas is a sine qua non for improving access. In other words, if improving the poor's access to medical care is a major goal of social policy, providing the care "free of charge", is simply not enough.

TABLE 5: **ARC Travel Time Elasticities by Income Quartile - Côte d'Ivoire Adult**

Range of Time*	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)
Clinic				
0-1	-0.35	-0.32	-0.28	-0.14
1-2	-0.61	-0.57	-0.50	-0.24
2-3	-0.85	-0.83	-0.72	-0.33
3-4	-1.10	-1.09	-0.95	-0.42
Clinic				
0-1	-0.25	-0.23	-0.21	-0.11
1-2	-0.44	-0.42	-0.37	-0.19
2-3	-0.65	-0.62	-0.55	-0.27
3-4	-0.85	-0.84	-0.74	-0.34
Mean Income **	33.29	64.44	99.52	222.87

* Time is reported in hours.
** Measured in thousands of Ivorian CFA

TABLE 6: **ARC Travel Time Elasticities by Income Quartile - Côte d'Ivoire Adults**

Range of Time* Change	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)
Clinic				
0-1	-0.53	-0.54	-0.54	-0.40
1-2	-0.93	-0.96	-0.98	-0.68
2-3	-1.33	-1.39	-1.43	-0.92
3-4	-1.72	-1.80	-1.88	-1.10
Hospital				
0-1	-0.41	-0.42	-0.42	-0.31
1-2	-0.71	-0.73	-0.75	-0.57
2-3	-1.03	-1.07	-1.12	-0.75
3-4	-1.37	-1.44	-1.52	-0.95
Mean Income **	33.29	64.44	99.52	222.87

* Time is reported in hours.
** Measured in thousands of Ivorian CFA

6.3 Peru

6.3.a Institutional Environment and Measurement of Variables

Since the data for the Peru models come form a survey instrument that is virtually identical to the one used for the Côte d'Ivoire survey, the empirical specification and the variables are constructed in almost the same way. Some differences are necessary as the institutional environment is different. Specifically, unlike Côte d'Ivoire, there is a large private health-care sector which charges fees for utilization of their services. In this section we highlight the differences between Peru and Côte d'Ivoire, relevant for estimating the Peruvian provider choice model.

Rural Peru has a mix of public and private medical care. The major provider of public medical care is the Ministry of Health, which operates hospitals and clinics. These institutions are administrated at the health department (region) level, where the user fee is set. In 1985/1986, user fees were very low. We used the department's median clinic and hospital fee paid by individuals in our sample as monetary prices. There are 14 departments in our sample. The total prices of clinic and hospital care are the sum of the department level monetary prices and the opportunity costs of time, where the opportunity cost of time is calculated as the product of the round-trip travel time and the appropriate village level agricultural wage rate. For children the opportunity cost of the mothers' time is used.

The dominant private pr--iders are physicians. As was true with Côte d'Ivoire, very few individuals reported seeking care from a traditional healer, so we leave them out of the analysis. We use median private doctor prices paid by individuals in each department in our sample as monetary

prices. Again, the total price of private care is the sum of the village level monetary price and the opportunity cost of time.

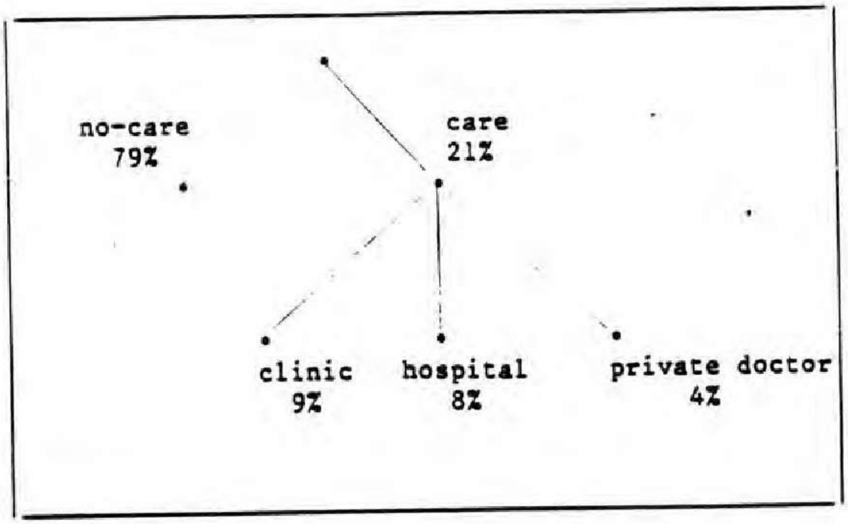
In the Peruvian specification, an individual experiencing an illness or accident has four alternatives: private doctor, government hospital, government clinic, or self-care. The distribution of provider choice in our sample is given in Figure 2. It is interesting to note that Peruvians who experience an illness or injury, use medical care only about half as much as Ivorians.

Consumption net of medical care expenditures for each alternative is computed as income minus the sum of the monetary price of the alternative and the opportunity cost of travel time. Income is computed as the annual value of total household consumption divided by 12, and the opportunity cost of time is the appropriate male or female wage rate times the round trip travel time.

The arguments of the alternative specific utility of quality functions are the same as used in the Côte d'Ivoire section. They are age, the number of healthy days last month, education, the number of other adults in the household, and the number of children in the household. Again, age is entered in spline form with the break occurring at 40 years old for adults and at 3 for children. Education is calculated as years of schooling with mother's education being used for children.

FIGURE 2: Health-care Provider Choice

in Rural Peru



In the Peru models, 37% of the households were excluded because they were in villages for which community level information was unavailable. A few visits for obstetrics and other preventive purposes were also excluded. The final sample included 1254 adults and 969 children under age 16 from 98 villages.

Thus, the main differences between the Ivorian and the Peruvian model are: (1) in Peru the patient has four, rather than three, choices and (2) the cost of obtaining care includes a monetary component as well as a travel time component. Note that rural Peruvians households are on average better-off than their Ivorian counterparts. In dollar terms, monthly per capita income is about \$34 as compared to \$23 in Côte d'Ivoire.

TABLE 7: Descriptive Statistics - Peru

Variables	Adults		Children	
	Mean	Standard Deviation	Mean	Standard Deviation
Clinic a/	.13	0.29	0.08	0.27
Hospital a/	.08	0.27	0.05	0.21
Doctor a/	.04	0.19	0.04	0.19
Clinic Price c/	1.32	0.76	1.37	0.86
Hospital Price c/	2.43	1.06	2.30	1.01
Doctor Price c/	22.27	16.57	23.95	16.59
Clinic Travel Time b/	2.02	2.68	2.30	2.70
Hospital Travel Time b/	4.56	6.23	4.83	6.11
Doctor Travel Time b/	3.54	2.92	3.56	2.88
Monthly Family Income c/	1262.24	1332.86	1320.35	1179.45
Hourly Wage c/	0.18	0.11	0.19	0.12
Age	43.52	18.11	6.52	4.48
Male a/	0.42	0.50	0.51	0.50
Education	2.28	2.76	3.25	3.60
Healthy Days	25.00	5.42	25.19	4.97
Number of Adults	3.16	1.35	2.71	1.05
Number of Children	2.62	2.01	3.83	1.59
Sample Size	1254		969	

a/ Binary variables; equals one if alternative is chosen and zero otherwise.

b/ Round trip travel time; reported in hours.

c/ Reported in June 1985 Peruvian Intis.

6.3.b Estimation Results

The results of maximum likelihood estimation of medical care provider choice models of Peruvian children and adults are presented in Table 8. As for Côte d'Ivoire, the coefficients on the consumption term and its square are significantly different from zero in both the adults' and children's models. These results confirm that the relative prices of the alternatives are important determinants of provider choice. The direction and magnitude of the price and income effects are examined in the next section. This section discusses the effects of the other variables. We begin with the adults' model and then turn to the results for children.

The estimated value of σ is .98 for adults and .44 for children. The estimate of σ in the adult model is significantly different from zero, but we could not reject the hypothesis that it is different from one. Therefore, the adult model is consistent with utility maximization, but the MNL is not rejected in favor of the NMNL. The estimates of in the children's model is significantly different from zero and from one. Therefore, the children's model is consistent with utility maximization, and rejects the MNL specification in favor of the NMNL.

Utilization of medical care by Peruvian adults over the life cycle differs from the use of health-care by adults in Côte d'Ivoire. The coefficients on the age splines indicate that an adult who experienced an accident or illness, is more and more likely to seek professional medical care as he or she ages until forty years old. After age forty, utilization continues to increase with age but at a slower rate.

Education has a strong positive effect on the decision to seek medical care. Moreover, educated individuals show a preference for the higher quality hospital and private care over the lower quality clinic care. This conforms better to results from developed countries than the Ivorian results on this issue. Generally, one finds that education strongly influences the decision to seek medical care, and that more educated individuals choose the higher quality options. This adds further to our belief that the negative education results for Côte d'Ivoire are due to the lack of variation in the education variable rather than reflecting a true education effect.

We find that females are much more likely to seek medical care to treat an illness or accident, and are more likely to choose hospital than private physician care or clinic care. This is the opposite to what we found in Côte d'Ivoire, but at this point we can only speculate about whether this is a gender-bias affect, the result of rational decisions based on the expected productivity of the individual, or the efficacy of the health care system in treating gender specific illnesses.

The other variables were commensurate with the Côte d'Ivoire results. Not surprisingly, the number of healthy days last month significantly reduces the probability of seeking medical care. The number of adults in the household has a negative effect on the probability of going to both clinics and hospitals, while the number of children has positive effects. Thus, families with more adults and fewer children are better able to care for sick family members at home, than are families with fewer adults and more children.

The results from the model for Peruvian children are in general similar to those from the Peruvian adult model and conform to most studies on medical care demand in developed countries. The age profile of health care utilization is identical to Côte d'Ivoire. Infants have the highest probability of seeking medical care to treat an accident or illness. The probability then falls with age until three years old and is flat thereafter, *ceteris paribus*.

We also found that more educated mothers are more likely to use clinic care. This result is consistent with previous work. Although we are not aware of studies that focus exclusively on children's health-care demand in developing countries, mother's education has been shown to have a strong positive effect on children's health status (e.g. Strauss, 1988). Medical care utilization by Peruvian children does not differ by gender, which matches what we found in Côte d'Ivoire.

TABLE 8: **The Nested Multi-Nomial Logit of Provider Choice Estimates for Peru**

Variable	Adults		Children	
	Coefficient	t-Statistic	Coefficient	t-Statistic
Consumption*	5.13	(2.14)	6.88	(2.37)
Consumption squared**	-0.16	(2.26)	-0.21	(2.04)
Sigma	0.98	(2.03)	0.44	(1.71)
Private Doctor				
Constant	-1.04	(0.56)	-2.30	(1.99)
Age1	0.01	(0.40)	-0.59	(1.35)
Age2	0.01	(0.39)	-0.15	(1.84)
Education	0.18	(2.61)	0.00	(0.58)
Male	-0.26	(0.70)	0.61	(0.34)
Children	0.03	(0.31)	0.27	(1.91)
Adults	-0.45	(4.52)	-0.83	(2.36)
Healthy Days	-0.08	(3.34)	-0.26	(3.30)
Hospital				
Constant	-1.61	(1.63)	3.12	(1.15)
Age1	0.06	(3.48)	-0.63	(1.03)
Age2	-0.02	(1.47)	0.02	(0.42)
Education	0.20	(4.51)	0.06	(0.25)
Male	-0.69	(2.66)	0.35	(0.38)
Children	0.09	(1.46)	-0.12	(0.40)
Adults	-0.19	(2.59)	-0.75	(1.87)
Healthy Days	-0.11	(6.31)	-0.22	(2.38)
Clinic				
Constant	-1.65	(1.91	3.58	(1.39)
Age1	0.03	(1.65)	-0.06	(1.79)
Age2	-0.01	(0.45)	0.02	(0.42)
Education	0.10	(2.25)	0.12	(1.97)
Male	-0.03	(0.13)	0.43	(0.96)
Children	0.08	(1.34)	0.26	(1.70)
Adults	-0.06	(0.66)	-0.73	(2.38)
Healthy Days	-0.06	(3.64)	-0.23	(5.55)
Sample Size	1254		913	
Log Likelihood	-843		471	

* Variable was divided by 100 for estimation.
** Variable was divided by 100,000 for estimation.

6.3.c Price Elasticities

To show the effect of prices (total costs) on medical care utilization we computed arc price and travel time elasticities. Arc price elasticities of the demand for clinic, hospital, and private doctor care by income quartiles are presented in Table 9 for adults and Table 10 for children. The arc elasticities are calculated for three fee levels, ranging from 0 to 30 intes. Reading down a column of Table 9 or 10 shows the change in the price elasticity moving down the demand curve, holding income constant. Reading across a row of Table 9 or 10 shows the change in the price elasticity as income rises, holding price constant.

The estimates show that the price elasticity of demand falls with income so that poorer individuals are more price sensitive than are richer individuals. Indeed, the price elasticities increase from completely inelastic in the highest income quartile to being into the elastic range in the lowest income quartile, in both the adult and children models. These estimates are commensurate with our results from the Côte d'Ivoire analysis. They imply that user fees can be a significant source of income for the health-care system. They also indicate that user fees will be regressive and may substantially reduce the use of medical care by the poor. Again children's demand for clinic and hospital care is more price elastic than adult demand.

Note that the result that the price elasticity of demand falls with income implies that the willingness to pay for medical care increases with income. This result is very similar to one obtained by Birdsall, et al. (1983). Using a survey technique, in which households in rural Mali were

asked directly how much they would be willing to pay for improvements in health services and water supply, they found the income elasticity of the willingness to pay for these services to be around .35.

TABLE 9: ARC Price Elasticities by Income Quartile - Peru; Adults

Range of Price Change *	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)	Overall
Private Doctor					
0-10	-0.53	-0.36	-0.15	-0.00	-0.25
10-20	-0.91	-0.62	-0.25	-2.02	-0.38
20-30	-1.30	-0.87	-0.36	-0.03	-0.49
Hospital					
0-10	-0.57	-0.38	-0.16	-0.01	-0.26
10-20	-0.96	-0.64	-0.26	-0.02	0.39
20-30	-1.36	-0.91	-0.37	-0.04	-0.50
Clinic					
0-10	-0.31	-0.21	-0.08	-0.00	-0.15
10-20	-0.61	-0.40	-0.15	-0.01	-0.27
20-30	-0.95	-0.61	-0.23	-0.02	-0.39
Mean Income *	395	783	1267	2620	1286

* Measured in June 1985 Peruvian Intis.

TABLE 10: **ARC Price Elasticities by Income Quartile - Peru; Children**

Range of Price Change *	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)	Overall
Private Doctor					
0-10	-0.20	-0.16	-0.13	-0.06	-0.14
10-20	-0.44	-0.36	-0.27	-0.12	-0.29
20-30	-0.84	-0.66	-0.48	-0.20	-0.52
Hospital					
0-10	-0.67	-0.48	-0.22	-0.33	-0.41
10-20	-1.18	-0.83	-0.38	-0.05	-0.64
20-30	-1.72	-1.20	-0.54	-0.09	-0.81
Clinic					
0-10	-0.76	-0.53	-0.24	-0.03	-0.46
10-20	-1.28	-0.89	-0.41	-0.06	-0.68
20-30	-1.80	-1.26	-0.57	-0.10	-0.83
Mean Income *	395	783	1267	2620	1286

* Measured in June 1985 Peruvian Intis.

Arc travel time elasticities of the demand for clinic, hospital, and private doctor care were calculated for four ranges of one hour each, covering 0 to 4 hours. They are presented in Table 11 for adults and in Table 12 for children. Unlike Côte d'Ivoire, the travel time elasticities are small relative to the price elasticities. This is not surprising since the opportunity cost of time is a smaller small portion of the total price of medical care in rural Peru. When monetary prices are large relative to the opportunity cost of time, the monetary prices ration the market and time prices are relatively unimportant. In Peru, time costs are, on average, only 3% of the total private doctor price, 25% of the total hospital price, and 21% of the total clinic price. Therefore, we find much less reaction to

changes in travel time, than was the case in Côte d'Ivoire where - in the absence of money prices - the total cost equals the opportunity cost of time lost in obtaining care.

TABLE 11: **ARC Travel Time Elasticities by Income Quartile - Peru; Adults**

Range of Time Change *	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)	Overall
Private Doctor					
0-1	-0.04	-0.02	-0.01	-0.00	-0.02
1-2	-0.07	-0.04	-0.02	-0.01	-0.04
2-3	-0.09	-0.05	-0.04	-0.01	-0.05
3-4	-0.11	-0.07	-0.05	-0.02	-0.06
Hospital					
0-1	-0.03	-0.02	-0.01	-0.00	
1-2	-0.04	-0.03	-0.02	-0.00	-0.02
2-3	-0.06	-0.05	-0.03	-0.01	-0.04
3-4	-0.09	-0.06	-0.04	-0.01	-0.05
Clinic					
0-1	-0.03	-0.02	-0.01	-0.00	-0.02
1-2	-0.07	-0.04	-0.01	-0.00	-0.03
2-3	-0.08	-0.05	-0.02	-0.01	-0.04
3-4	-0.09	-0.06	-0.03	-0.01	-0.05
Mean Income **	395	783	1267	2620	1286

* Time is reported in hours.

** Income is measured in June 1985 Peruvian Intis.

TABLE 12: **ARC Travel Time Elasticities by Income Quartile - Peru; Children**

Range of Time Change *	Quartile I (Lowest)	Quartile II	Quartile III	Quartile IV (Highest)	Overall
Private Doctor					
0-1	-0.04	-0.02	-0.01	-0.00	-0.02
1-2	-0.07	-0.04	-0.01	-0.00	-0.03
2-3	-0.10	-0.05	-0.02	-0.00	-0.04
3-4	-0.12	-0.06	-0.02	-0.00	-0.05
Hospital					
0-1	-0.04	-0.02	-0.01	-0.00	-0.02
1-2	-0.06	-0.03	-0.01	-0.00	-0.03
2-3	-0.09	-0.05	-0.02	-0.01	-0.04
3-4	-0.11	-0.06	-0.02	-0.01	-0.05
Clinic					
0-1	-0.03	-0.01	-0.01	-0.00	-0.01
1-2	-0.04	-0.02	-0.02	-0.00	-0.02
2-3	-0.06	-0.03	-0.02	-0.01	-0.03
3-4	-0.09	-0.04	-0.03	-0.01	-0.04
Mean Income **	395	783	1267	2620	1286

* Time is reported in hours.

** Income is measured in June 1985 Peruvian Intis.

6.4. Summary

In this chapter models of medical care provider choice were estimated using data from the Living Standards Surveys of rural Côte d'Ivoire and rural Peru. The Côte d'Ivoire model had government clinic and hospital care as provider alternatives, whereas the rural Peruvian model included private doctor care as well. These specifications reflect the actual institutional choices available to the population. In Côte d'Ivoire monetary prices were zero so that the market was rationed by the time costs involved in obtaining care from the providers. In Peru time costs were small relative to monetary prices. The models were estimated for children and adults separately. All models yielded similar price and income effects. The estimation results are overall consistent with common sense and economic theory.

Our primary purpose in estimating models of medical care provider choice is to evaluate the impact of charging user fees for government medical care services. In evaluating the effect of user fees, the cost recovery aspects must be balanced against the potential effects on utilization. Indeed, one of the rationales for providing free care is to reduce access barriers and increase utilization. This begs the equity question: are the utilization effects of user fees uniform across income groups? If poorer individuals' decision to use medical care are more price elastic than richer individuals', then user fees will be regressive in that they will reduce utilization of poorer individuals by more than richer individuals.

It is clear, then, that any ex ante evaluation of the user fee proposal requires knowledge of the demand function from which price elasticities can be calculated. Price elasticities provide information about

how user fees will affect utilization and revenues. Our estimates show that price is an important determinant of the decision to use medical care. In addition, we find that the price elasticity of demand falls in absolute value with income. More specifically, we find that demand is very elastic for individuals in the lowest income groups and completely inelastic for individuals in the highest income groups. These results are robust in that we observe them in both the Côte d'Ivoire and Peru models, for both children and adults.

Unlike most previous studies of the demand for medical care in the developing world, our results are quite consistent with the work on the demand for medical care in the developed world. The fact that we had access to high quality data and utilized a model that solves some of the shortcomings in previous studies are probably behind this.

Our bottom line is that user fees have a great potential for cost recovery, but that care must taken in implementing them. Uniform user fees can generate substantial revenues, but are very likely to reduce the utilization of medical care by the poor. Uniform user fees, then, would be regressive in that they act as access barriers to medical care for the poor but not for the middle and higher income groups. In the next section we will be more explicit about the policy implications of these findings, by using them to simulate the effect of introducing alternative health-care fee policies, in poor and better-off regions both in Côte d'Ivoire and Peru.

6.5 Appendix

In this appendix we report the estimation of the reduced form (misspecified) models employed in earlier work on the demand for medical aid in developing countries. The models were discussed in Chapter 5, sections 2 and 3. The purpose of this exercise is to provide results that are comparable to earlier work even though they cannot be interpreted structurally. In these models prices and income are entered linearly and income has alternative specific coefficients. In conjunction with the previous literature, the models are estimated as MNL's rather than as NMNL's. The data used to estimate alternative specific coefficients are described in chapter 6.

The results are presented in Table A1 for Côte d'Ivoire and Table A2 for Peru. It is interesting to note that statistically significant negative price effects are found in all four models. Moreover, income has a positive effect on health care demand and is statistically significant in most cases.

TABLE A.1: **Reduced Form Model of Provider Choice in Rural Côte d;Ivoire**

Variable	Adults Coefficient	Adults t-Statistic	Children Coefficient	Children t-Statistic
Price	-6.121	5.16	-6.055	8.02
Clinic				
Constant	-0.284	0.54	0.813	2.06
Income	0.002	1.84	-0.002	1.83
Age 1	0.012	0.091	-0.274	2.58
Age 2	-0.031	3.34	0.024	0.83
Education	-0.020	0.48	0.003	0.66
Holidays	-0.026	2.98	-0.024	2.02
Male	-0.106	-0.64	0.117	0.68
Children	0.040	1.48	0.057	1.98
Adults	-0.054	1.72	-0.110	2.48
Hospital				
Constant	0.096	0.16	0.653	1.43
Income	0.004	4.04	0.003	3.96
Age 1	-0.010	0.62	-0.338	2.37
Age 2	-0.042	3.93	0.014	0.38
Education	-0.028	0.57	-0.001	(0.08
Holidays	-0.057	5.56	-0.050	3.30
Male	0.0527	2.48	-0.081	0.35
Children	0.040	1.31	0.082	2.23
Adults	-0.068	1.71	-0.126	2.86
Log Likelihood	887.28		674.68	
N	1030		769	

TABLE A.2 **Reduced Form Model of Provider Choice in Rural Peru**

Variable	Adults Coefficient	Adults t-Statistic	Children Coefficient	Children t-Statistic
Price	-4.24	1.98	-8.39	2.25
<u>Doctor</u>				
Constant	-1.46	0.78	2.31	1.87
Income	0.19	1.21	0.35	1.81
Age 1	0.01	0.40	-0.27	1.35
Age 2	0.01	0.38	-0.13	1.77
Education	0.18	2.55	0.04	0.54
Male	-0.27	0.80	0.15	0.32
Children	-0.02	0.21	-0.26	1.86
Adults	0.45	4.29	0.47	2.34
Healthy Days	-0.68	3.27	-0.10	3.26
<u>Hospital</u>				
Constant	-1.95	1.96	1.82	0.99
Income	0.21	3.37	0.22	1.62
Age 1	0.06	3.58	-0.25	1.00
Age 2	-0.02	1.48	0.02	0.31
Education	0.20	4.44	0.01	0.22
Male	-0.68	2.62	0.17	0.48
Children	0.07	1.19	-0.06	0.44
Adults	0.17	2.24	0.28	1.72
Healthy Days	-0.11	6.20	-0.10	2.80
<u>Clinic</u>				
Constant	-1.80	2.08	1.04	1.19
Income	0.13	2.12	0.16	1.11
Age 1	0.03	1.65	-0.27	1.72
Age 2	-0.01	0.46	0.10	0.35
Education	0.10	2.16	0.07	1.90
Male	0.04	0.16	0.27	1.02
Children	0.02	1.19	-0.18	1.76
Adults	0.04	0.48	0.26	2.16
Healthy Days	-0.05	3.61	-0.11	5.51
Log Likelihood	830.83		469.08	
N	1254		913	

CHAPTER 7

Options for Policy Reform

7.1 Introduction

In previous chapters we argued that an ex ante assessment of the feasibility and desirability of introducing or raising user fees for medical care depends critically on consumers' responses to such a measure. More precisely, the potential for fees to generate revenues and the effects of fees on utilization and welfare depend on the price and income elasticities of demand. The major part of our research effort has been to generate reliable estimates of these elasticities.

Our results have demonstrated, among other things, that poorer people are much more sensitive to price changes than are the not-so-poor, so that the effects of price increases are likely to reduce the poors' utilization of medial care by more than the reduction of the population as a whole. How then can these findings be used to judge whether user fees can be introduced as an additional source of revenue, and to determine what fee levels can be set to prevent the poor from being effectively cut-off from obtaining medical care?

In this chapter we attempt to answer these questions by simulating the consequences of alternative price and reinvestment policies in various settings. For instance, in Côte d'Ivoire we try to evaluate whether it is financially feasible to locate a clinic in a poor remote village in the northern Savannah area. For Peru, we evaluate, among other things, pricing

policies for government clinics that take the private sector price responses into account.

The purpose of these simulations is to illustrate how, armed with the appropriate information, one can make rational decisions based on the trade-off between cost recovery and protecting the poor. Though in our examples we try to be as realistic as possible, moving from analytic results to specific policy recommendations requires a comprehensive assessment of the political, cultural and institutional specifics of the countries. These includes aspects of infrastructure, population trends, manpower planning and the fiscal and political environment. Therefore, actual policy should be based on a much more comprehensive analysis than is presented below, and our examples should be viewed as illustrations only and not as authoritative recommendations for the countries under study.

The analysis is limited to the trade-off between cost recovery and access. Our criteria to judge the feasibility and desirability of user fee policies are:

(1) the potential for raising revenues,

(2) changes in utilization patterns of medical care, and

(3) the welfare effects on the population, especially the poor

The first part of the chapter simulates various policy scenarios for Côte d'Ivoire, and the second gives examples for Peru. As always, the chapter ends with a brief summary.

In all cases the simulations are conducted by enumerating through the sample data. Two hypothetical villages are chosen from each country: one representing a population from the bottom quarter of the rural income

distribution and a second from the top quarter. Observations corresponding to the hypothetical villages are selected from our samples and used for the respective simulations. The simulations allow all relevant characteristics (education, family structure, wage rate, etc.) as well as income to vary across the villages.

Finally, we need to repeat that our model only incorporates the first visit to a provider. Since our model explains provider choice and not the total number of visits to a provider, we cannot simulate the effects of fees on follow-up visits. Therefore, we need to assume that the fee charged for the first visit covers the cost for the treatment of the entire illness episode, regardless of the number of follow-up visits (i.e. it is tantamount to a "registration fee" customarily charged at clinics in developing countries).

7.2 Policy Options in Rural Côte d'Ivoire

Background

In this section, we simulate the consequences of alternative fee policies in two different settings: a poor village in the Northern Savannah region of Côte d'Ivoire and a wealthier village in the West-Forest region. To make the exercise as realistic as possible, we start the analysis by presenting background information that is directly relevant to the issue at hand.

Rural Côte d'Ivoire can be divided into three regions: the Northern Savannah, and the East and West-Forest. Of the three, the Savannah is by far the poorest and the West-Forest the wealthiest. In the simulations we

consider a Savannah village whose residents would be in the bottom quarter of the rural income distribution in this area. Similarly, we use a wealthier than average West-Forest village (in the top quarter of this income distribution). The characteristics of these communities are given in Table 1. Except for the consumption variables, these characteristics represent average villages in their region.

Per capita consumption levels in 1985 in the relatively well-off West-Forest village (CFA 156,000) were about three times as large as in the poor Savannah village (CFA 60,000). Daily wage rates for agricultural workers in the West-Forest (CFA 700) were more than twice the rates in the Savannah (CFA 300). Virtually, all households in the Savannah are small farmers with three-quarters of them having less than five hectares of land available for cultivation. In comparison, three quarters of the farmers in the West-Forest have more than five hectares and twenty-five percent have over fifteen hectares.

The structure of agricultural production in the two regions is also very different. The major export crop in the Savannah is cotton which is grown by about one-third of the farms. Most of the other agricultural production in the Savannah is food for home consumption and for sale in the local markets. In contrast, the West-Forest is characterized by cocoa and coffee cultivation. These crops are the country's major export and source of foreign exchange. Over 90% of the farms in the West-Forest cultivate cocoa and/or coffee.

The economy of both regions is only partially monetized with a good portion of food consumption produced on the household farm. Health care expenditures are likely to come from the non-food budget which consists of

cash purchases and possibly from the monetized portion of the food budget. In the Savannah, the food share of total household consumption is 70%, leaving only CFA 18,600 per capita for non-food cash expenditures (Table 1). Sixty percent of food consumption is home produced, implying that an additional CFA 17,360 cash per capita is spent to purchase food. Thus, in the Savannah, the total cash budget is CFA 35,960 per capita or about 60% of total consumption.

TABLE 1: **Characteristics of Savannah and the West-Forest Villages**

	West-Forest	Savannah
Agricultural Daily Wage	CFA 700	CFA 300
Per Capita Consumption	CFA 156,000	CFA 60,000
Per Capita Food Consumption	CFA 93,600	CFA 43,400
Per Capita Non-Food Consumption	CFA 62,400	CFA 18,600
Per Capita Cash Expenditures	CFA 109,000	CFA 35,960
% Piped Water	85%	79%
% Latrine or Toilet Facilities	44%	20%
Closest Paved Road (km.)	1 km	9 km
Closest Medical Professional (km)	5 km	22 km
% Ill (last two weeks)	28%	34%
% of Ill Who Obtain Med. Care	45%	37%

Source: 1985 Côte d'Ivoire Living Standards Survey

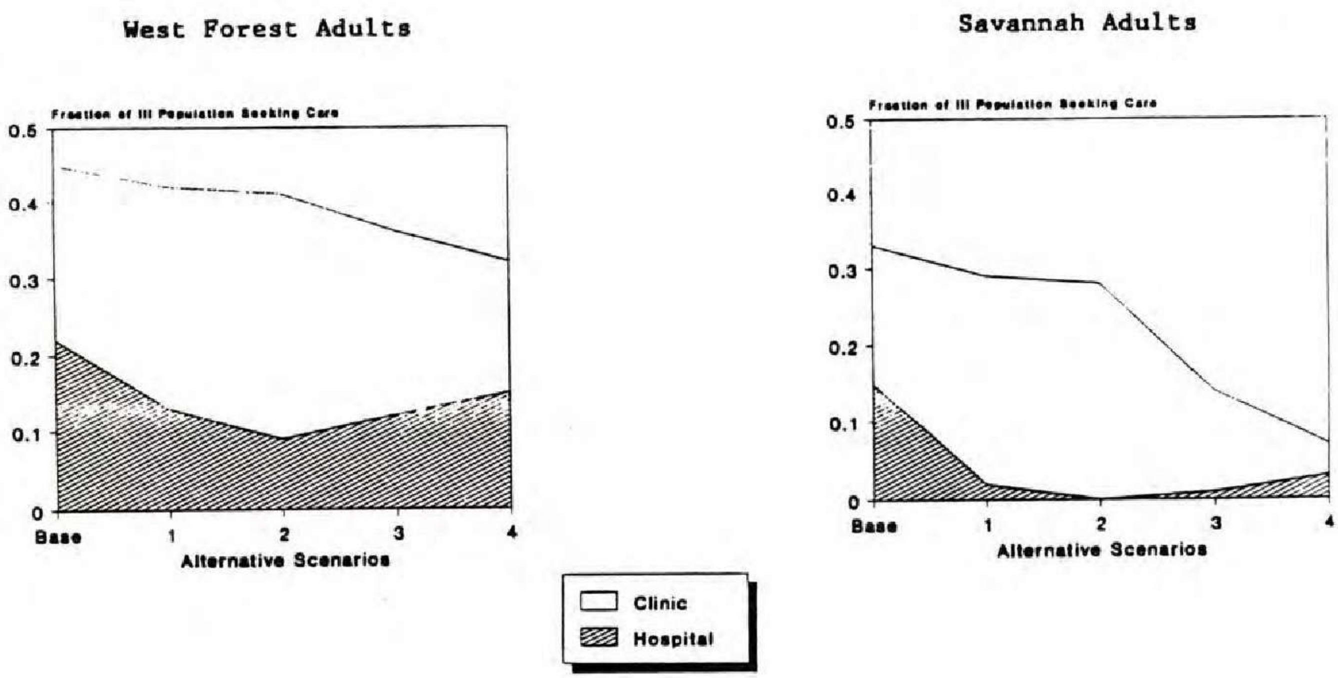
In the West-Forest much more money is available for cash expenditures. The food share is about 60%, leaving about cfa 62,400 per capita for non-food cash expenditures or about three and one-half times what is available in the Savannah. In addition, only 50% of the food budget is home produced, implying that cfa 46,800 cash per capita is spent on food. Total cash expenditure in the West-Forest, then, amount to about cfa 109,200 or about three times the amount spent in the Savannah.

The infrastructure and public health environment of a typical Savannah village reflects the region's relative poverty. Approximately 21% of the households do not have access to relatively clean piped in water and must obtain it from rivers, and 80% of the households have no latrine or toilet facilities. In contrast, only 15% of households in the West-Forest do not have access to clean water, and 56% do not have latrine or toilet facilities. The Savannah is more isolated than the West-Forest as the closest paved road is located, on average, 9 kilometers from Savannah villages, whereas the closest paved road is less than 1 kilometer from West-Forest villages. Moreover, individuals in the Savannah must travel on average 22 kilometers to nearest medical facility, whereas individuals in the West-Forest need to travel less than 5 kilometers on average.

The poor public health environment and poverty manifest themselves in the incidence of illness and medical care utilization. In the four weeks prior to the survey, approximately 34% of individuals living in the Savannah experienced an illness, whereas only 28% experienced an illness in the West-Forest. Of those who were ill, 37% consulted a medical professional in the Savannah, but 45% consulted a professional in the West-Forest.

Another piece of information useful for this exercise is the cost of providing medical care in Côte d'Ivoire. By knowing the cost of care we can evaluate the revenue potential in terms of costs recovered, and we can compare the willingness to pay for improvements in the system, relative to the costs of the improvements. Let us begin with clinic care. Clinics in rural Côte d'Ivoire are usually staffed with one nurse. A typical nurse's salary is CFA 115,000 per month. If a nurse were to spend between 20 and 30 minutes with each patient, a nurse could see about 400 patients a month. Hence, assuming

FIGURE 1: User Fee Simulations; Côte d'Ivoire



this patient load, the average labor cost per visit is CFA 285. In addition to labor, the major source of variable costs is drugs, which come to about CFA 315 per visit (Over 1988). Hence, the average cost per visit is about CFA 600. We will assume that the marginal cost of hospital care is the same as clinic care, while recognizing that hospitals have substantially higher fixed costs.

User Fees Without Reinvestment

As mentioned earlier, clinics and hospitals in Côte d'Ivoire currently do not charge user fees. To investigate what might happen to the utilization of these facilities if the government raised user fees, we consider the following options sequentially:

price scenario (1): raising hospital user fees to CFA 300

price scenario (2): raising hospital user fees to CFA 600

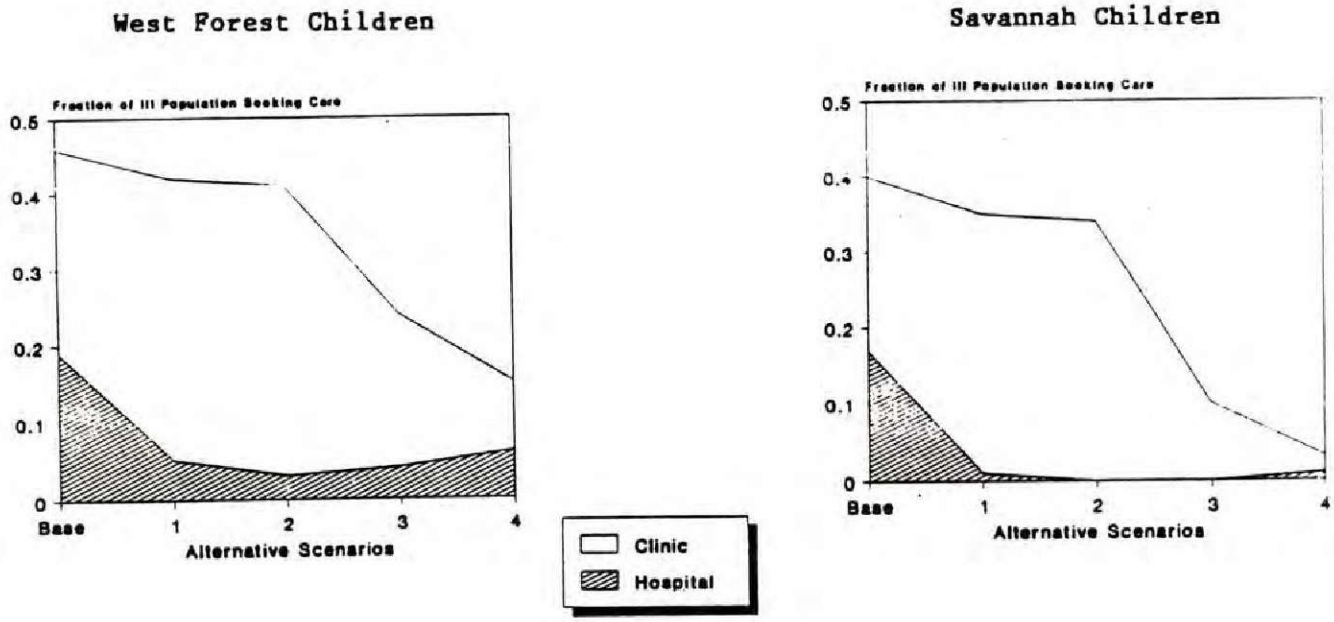
price scenario (3): raising clinics user fees to CFA 300 and maintaining the hospital fee at CFA 600

price scenario (4): raising clinic user fees to CFA 600 and maintaining the hospital fee at CFA 600.

These levels were chosen to correspond to charging approximately half of marginal cost (CFA 300) and all of marginal cost (CFA 600). Thus, at capacity (400 visits) these clinic fee levels correspond to half cost recovery and full cost recovery, respectively.

The results of the policy simulations are pictured in Figure 1 for adults and Figure 2 for children. The estimated fraction of the ill population choosing each alternative for the various pricing schemes is given along the vertical axis for each of the four price scenarios and for the base case with zero fees.

FIGURE 2: User Fee Simulations; Côte d'Ivoire



We begin with the base case where no fees are charged for both hospitals and clinics. This base case corresponds to the actual current situation. In this case, the opportunity cost of travel time rations the market. In the relatively well-off West-Forest village, where per capita income is higher and medical care facilities are closer, the use of medical care is substantially higher. Specifically, 45% of ill adults and 46% of ill children seek medical care, whereas in the poor Savannah village only 33% of adults and 40% of children seek care.

The response to price rises differs dramatically between these two hypothetical villages. At full cost recovery for hospitals (CFA 600), the number of adults in the West Forest seeking care is about 41% or a fall of about 9%, whereas adult utilization in the Savannah village falls to 18%, or a reduction of about 55%. Similar relative responses are observed for children as well. When fees are increased to full cost recovery levels in clinics (CFA 600) as well as in hospitals, both adults and children are effectively priced out of the market in the Savannah as utilization of adults drops to 7% and children to 3%, whereas in West-Forest 32% of adults and 15% of children still seek care.

One of the advantages of the nested multinominal logit specification is that it allows cross-price elasticities to differ across alternatives. Notice in Figures 1 and 2 that as we begin to increase the hospital fee most of the reduced hospital demand shifts to clinic care as opposed to self-care. Hence, user fees at hospitals can shift demand to clinics without substantial reductions in total utilization.

It is interesting to note that at zero prices children's utilization rates are about the same as adults' in both the West-Forest and the

Savannah. Then, as prices rise, children's' demand falls faster than adults' so that at full cost recovery prices, children's' utilization is lower than adults.

Earlier in the discussion we implied that a fee of CFA 600 would generate enough revenues to cover the variable costs of clinic care. This of course relied on the assumption that there would be approximately 400 visits per month, i.e. enough visits to cover one full-time nurse's salary plus the cost of drugs. For planning purposes it is important to take into account the aggregate demand response to determine if there is sufficient utilization. The question is, then, what size communities will support clinics at the various cost-recovery levels. From the information on the probabilities of seeking care and the probabilities of experiencing an illness reported in Table 1, we can derive the approximate population necessary to generate 400 visits to a clinic. These are reported in Table 2 for the three fee levels: zero cost recovery, half cost recovery, and full cost recovery. These estimates were derived under the assumption that hospitals charged a user fee of CFA 600.

TABLE 2: Population Necessary to Generate 400 Visits

	Hospital Price	Clinic Price	Population	
			West-Forest	Savannah
Zero Cost Recovery	600	0	1,750	3,650
Half Cost Recovery	600	300	1,900	8,100
Full Cost Recovery	600	600	2,850	20,300

At zero cost recovery a population of about 1,750 in the West-Forest and about 3,650 in the Savannah would support a clinic. At fees levels that would cover about half of costs, the population necessary to support a clinic in the Savannah is about four times the size in the West-Forest, and for full cost recovery the Savannah population has to be seven times bigger. The large differences in the population necessary to support a clinic reflect the dramatic differences in utilization rates in the two regions at the CFA 300 and CFA 600 fee levels.

User Fees With Reinvestment

As discussed earlier, when monetary prices are low the opportunity cost of time rations health care demand. Typically, medical care facilities are located much closer to patients in the wealthier regions (urban) than in poorer regions (rural). In rural Côte d'Ivoire, individuals living in the West-Forest travel on average less than one-half hour one-way to a clinic, whereas Savannah residents must travel more than one and one-half hours on average. Thus, a uniform fee schedule implies a regressive pricing policy even at zero monetary cost.

In this section, we evaluate the effect on consumers' welfare of the proposal to locate clinics in villages the currently have no facilities and then charge user fees for access. The benefit to individuals from implementing this proposal depends on whether the reduction in welfare resulting from having to pay user fees is less than the improvement in welfare from having access to medical care facilities within the village. The welfare neutral fee is the amount consumers would be willing to pay not to have to travel (i.e. the compensating variation). If the welfare neutral fee is more

than the marginal cost of medical care, the policy is welfare improving. On the other hand, if the welfare neutral fee is less than the marginal cost, then the policy would reduce welfare.

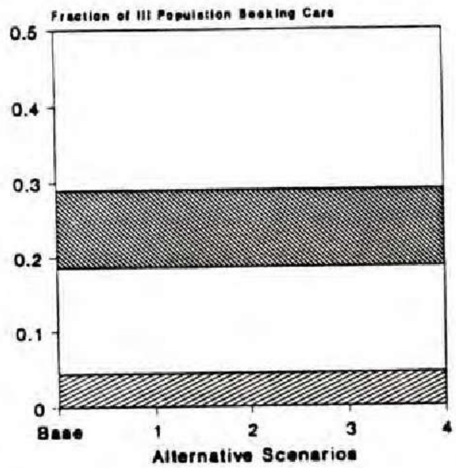
The welfare neutral prices are derived from compensating variation experiments. Three welfare neutral prices are calculated for an average individual in each of the two hypothetical villages; how much an individual is willing to pay not to have to travel to a free clinic that is currently 1 hour away, 2 hours away, and 3 hours away. The experiments are conducted assuming that the closest hospital is 4 hours away and charges a user fee of CFA 600.

The welfare neutral prices are reported in Table 3. Reading across a row shows the change in willingness to pay as it depends on the current distance to the clinic. Of course, the welfare neutral prices increase with this distance for both children and adults in both villages. West-Forest residents are willing to pay one and one-half times as much as adults in the Savannah. The welfare neutral fees are 5% and 15% of the marginal cost of providing clinic care. Hence, implementing the proposal to locate clinics in villages and charge users marginal costs will lead to a reduction in welfare. For the policy to be welfare improving, a subsidy of approximately 90% is required.

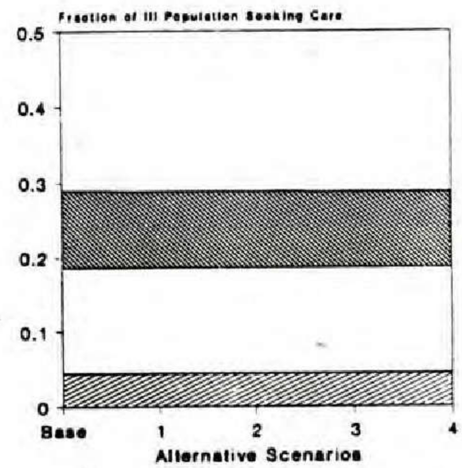
Before drawing the most important policy implications of these results, we will simulate the outcome of a similar set of policy alternatives for two hypothetical villages in Peru.

FIGURE 3: User Fee Simulations - Peruvian Adults

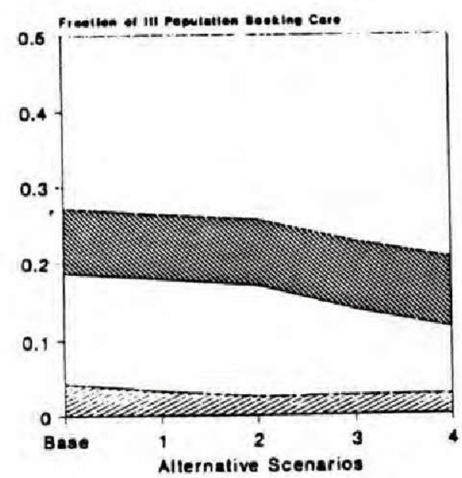
Coastal - No Private Doctor Price Response



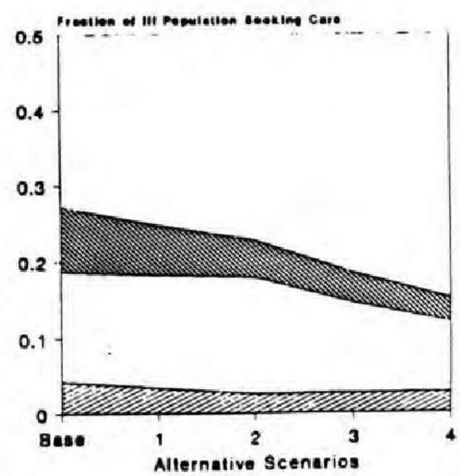
Coastal - Equal Private Doctor Price Response



Sierra - No Private Doctor Price Response



Sierra - Equal Private Doctor Price Response



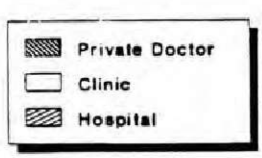
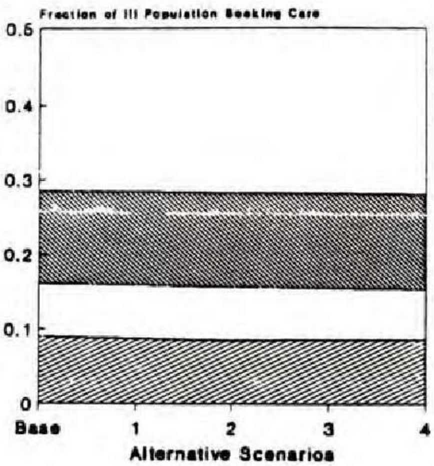
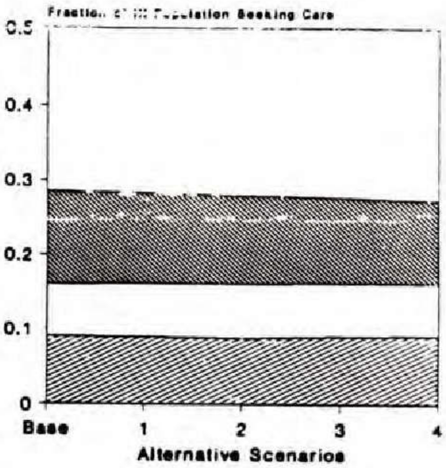


FIGURE 4: User Fee Simulations - Peruvian Children

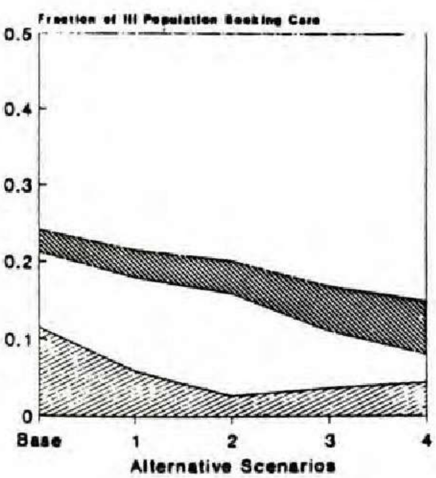
Coastal - No Private
Doctor Price Response



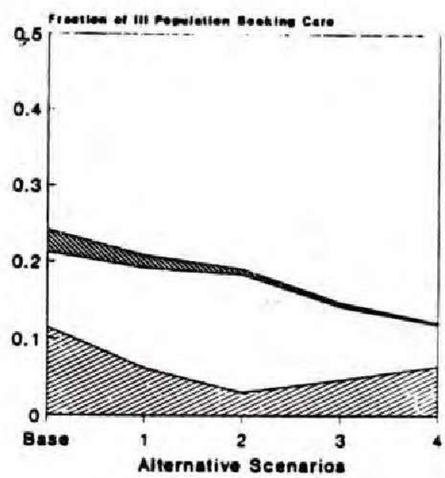
Coastal - Equal Private
Doctor Price Response



Sierra - No Private
Doctor Price Response



Sierra - Equal Private
Doctor Price Response



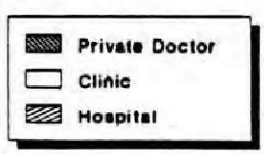


Table 3: **Willingness to Pay (CFA) For Reduced Travel Time**

	Travel Time to Clinic		
	1 Hour	2 Hours	3 Hours
West-Forest Adult	46	62	78
Savannah Adult	16	22	27
West-Forest Child	28	46	57
Savannah Child	14	19	38

7.3 Policy Options in Rural Peru

Peru can be decomposed in three large regions: the Forest, the Sierra, and the Coast. Of the three the Sierra is by fare the poorest and the Coast the richest. Residents of the Sierra are among the poorest in the world and their incomes are similar to that of residents of the poorest regions in Côte d'Ivoire. On the other hand, residents of the Coast are quite well off and indeed are much wealthier than residents of the West Forest region in Côte d'Ivoire. In this section we will simulate the likely effects of various user fee policies in two hypothetical villages: a poor village in the Sierra whose residents are in the bottom quarter of the rural Peruvian income distribution, and a wealthy village on the Coast whose residents are in the top quarter of that income distribution.

The characteristics of these two villages are presented in Table 4. The differences in wealth are apparent. Average agricultural workers' daily wage rates in the Coast are twice those in the Sierra, and per capita annual consumption in the Coast (2520 intis) is approximately two and one-half times per capita consumption in the Sierra (960 intis). In the poorer Sierra, about

76% of total consumption is spent on food, leaving only 230 intis per capita. In the Coast, only 60% of the total consumption is spent on food, or - in absolute value - over three times what is spent in the Sierra.

The infrastructure and public health environment reflects the relative poverty of the Sierra as well. Only 10% of households in the Sierra have access to relatively clean piped in water, and the rest must obtain it from rivers and streams. In the Coast, 58% of households have piped in water. Only 31% of households have latrine or toilet facilities in the Sierra, whereas 41% have these facilities in the Coastal area. Moreover, the closest medical facility is 4 hours travel time on average from Sierra households, and only 1.25 hours from Coastal households.

These differences manifest themselves in morbidity rates and in the utilization of health care. In the Sierra, approximately 43% of all individuals experienced an illness in the four weeks prior to the survey, and 24% of them sought formal medical attention. On the other hand, only 30% of Coastal residents experienced an illness, and 30% of them sought formal medical attention.

TABLE 4: **Characteristics of the Sierra and Coastal Villages**

Variable	Sierra	Coast
Daily Ag. Wage Rate	1.3	2.6
Per Capita Total Consumption	960	2520
Per Capital Food Consumption	730	1590
Per Capita Non-Food Consumption	230	930
% Piped water	10%	59%
% Latrine or Toilet Facilities	31%	41%
Closest Medical Professional	4 hrs	1.25 hrs
% Ill (last four weeks)	43%	30%
% of Ill Who Obtained Med. Care	24%	30%

Finally, we need information on the recurrent costs of medical care. Data from the PLSS indicate that a nurse's monthly income is about 1000 intis on average. Assuming approximately 400 visits per month, this implies an average labor cost of about 2.5 intis per visit. Drugs costs for respiratory and digestive problems average 15 intis (Gerrafi, 1987). This amounts to an average cost of about 17.5 intis per visit.

User Fees Without Reinvestment

Currently, government clinics and hospitals charge small user fees - from 1 to 5 intis depending on the region. In this section we evaluate the likely effects of increasing user fees to half and full cost recovery levels. Unlike Côte d'Ivoire, Peru has a large private sector. Increases in prices at government facilities are likely to shift demand to the private sector. The increased demand may cause private doctors to increase their prices, and consequently further reduce the number of ill individuals that

obtain medical care. Thus, a complete evaluation of user fees requires one to take into account the private doctor supply response. Unfortunately, we have no information about the slope of the private doctor supply function. Therefore, we will consider two extreme scenarios under the belief that the likely scenario is somewhere in between. The two scenarios are: no private doctor price response, and an increase in private doctor prices equal to the increase at public facilities.

We first consider the impact of charging user fees at hospitals and consider the effects of extending them to clinics. Again we consider fee levels at the half and full cost recovery levels. We begin by simulating a base case in which clinic and hospitals charge zero fees. It is important to note though that this is not reflective of the current situation as government facilities currently charge small fees. The user fee simulations are:

Price Scenario (1) raising hospital fees from 0 to 7.5 intis

Price Scenario (2) raising hospital fees from 7.5 to 15 intis

Price Scenario (3) maintaining hospital fees at 15 intis and raising clinic fees from 0 to 7.5 intis

Price Scenario (4) maintaining hospital fees at 15 intis and increasing clinic fees from 7.5 to 15 intis.

These user simulations are performed twice: once assuming that the private sector does not respond at all to changes in the price of public health services. The second set of simulations assumes that private doctors raise their prices by an amount equal to the increase in public facility fees. The results of the policy simulations are reported in Figures 3 and 4, which show

the faction of the ill population that obtains medical care from each of the available alternative providers, including self-care, for each of the above price scenarios.

The base-case in Figures 3 and 4 refers to the situation under which hospitals and clinics do not charge a user fee. In the base-case, 29% of adults and children from the relatively well-off coastal obtain professional medical-care to treat an accident or illness. In the poorer Sierra village, 27% of adults and 24% of children seek professional medical-care.

As was that case for Côte d'Ivoire, the utilization response to increase in user fees is dramatically different in the two villages. The figures show that charging user fees at full cost recovery levels at both hospitals and clinics has negligible effects of the utilization of professional medical care by both adults and children from the Coastal village. On the other hand, raising user fees in the Sierra clinic and hospital does have large utilization effects. Let's begin with the scenario in which there is no private doctor price response. Under this assumption, an increase in fees in the Sierra region to full cost recovery level at hospitals (price scenario 2), reduces adult hospital demand by about 42% and children's demand by about 76%. Total adult medical care utilization falls by about 6% and total children's utilization falls by about 16%. An additional increase in clinic fees to full cost recovery levels (price scenario 4) reduces adult clinic demand by 39% and children's' clinic demand by 62%. Moreover, at full cost recovery fee levels total adult demand falls by 24% and total children's' demand falls by 38%. Under the assumption of equal private doctor price response the reduction in total utilization is even larger. At full cost recovery fee levels (price scenario 4) total adult demand is reduced by 44% and total children's demadn by 46%.

Now we calculate the population base necessary for a clinic to be financially self sufficient. Table 5 reports the population necessary to generate 400 clinic visits a month under the various price scenarios. We begin with full cost recovery fees at hospitals and zero fees at clinics. Notice that the population base in Sierra is smaller than in the Coast for the first two price scenarios. This because the probability of developing an illness is greater in the Sierra than on the Coast. Another interesting point is that the population bases at the lower coast recovery scenarios are larger than in Côte d'Ivoire. This is because both the illness probabilities and utilization rates are higher in Côte d'Ivoire than in Peru.

TABLE 5: Population Necessary To Support A Clinic

	Coast No Price Response	Coast Equal Price Response	Sierra No Price Response	Sierra Equal Price Response
Price Scenario 2	17,400	17,100	9,600	8,800
Price Scenario 3	18,100	17,300	15,000	12,700
Price Scenario 4	18,[illegible]0	17,400	26,200	20,300

User Fees with Reinvestment

In this section we investigate the feasibility of improving access to clinics by reducing travel time and charging users the recurrent cost of operating the new facilities. In this way we can evaluate the possibility that increased access to medical care can be self-financed by users. Again we do so by calculating the welfare neutral fees. Which are the prices which people are willing to pay to avoid traveling long distances to obtain medical care. Recall that the willingness to pay is calculated as a compensating variation using the formulas derived in the previous chapter. Three welfare neutral prices are calculated for an average individual in both villages: the amount an individual is willing to pay not to have to travel 1 hour, 2 hours and 3 hours to a clinic, respectively. The experiments are conducted assuming that the closest hospital is 4 hours away and charges a user fee of 15 intis, and a private doctor is 2 hours away and charges 20 intis.

The welfare neutral prices are reported in Table 6. Reading across a row indicates the change in the welfare neutral price as the travel time rises, and reading down a column indicates how the price changes as income rices. Residents of the Sierra village are willing to pay almost nothing to avoid traveling, while residents of the Coastal village are willing to about

10% of the recurrent costs of operating a clinic.

Table 6: **Willingness To Pay For Reduced Travel Time To A Clinic**

	1 Hour	2 Hours	3 Hours
Coastal Adult	.56	1.07	1.54
Sierra Adult	.00	.01	.02
Coastal Child	1.01	1.94	2.80
Sierra Child	.03	.06	.09

7.4 Conclusion; Policy Implications

In this section we used the estimated demand functions from the previous chapters to simulate the likely effects of various user fee policies in two hypothetical villages in the two countries under study: one poor village and one richer village in each country. Though both countries are very different, the simulation results are quite similar. The results indicate that user fees at half and full marginal cost levels would effectively price residents for the poorer communities out of the medical care market. Alternatively, user fees at these levels do not seem to substantially deter medical care utilization by residents of the wealthier village. Thus, it appears that user fees are a potential source of substantial revenues for the health-care sector, but poorer communities need to be protected from the adverse effects on utilization of the implementation of substantial fees.

Two other simulation results have immediate policy implications. First, charging fees for higher levels of care (e.g. hospitals) clinic care, generally causes individuals to substitute to other types of care rather than to drop out of the medical care market. Secondly, user fees seem to have a greater negative effect on childrens' utilization of medical care than on adults'.

. The simulation results on charging fees while reducing travel time to zero, show that this policy would substantially reduce welfare and utilization both in the richer and poorer villages. Hence, this (extreme) type of expansion of the health care system in rural areas cannot be completely user-financed and requires about a 90% subsidy to be welfare improving.

Finally, let us place these results in a family budgetary context. Given the probabilities of experiencing an illness, the probabilities of seeking medical care, and the cost of care, we can derive the ex ante subsidy provided to an individual when medical care is provided free of charge. Zero user fees imply an annual subsidy of about CFA 1,460 per capita in the wealthier Ivorian villages and CFA 960 per capita in the poorer village. The subsidy amounts to 0.9% of the total budget for wealthy families and about 1.6% of the total budget for poorer families. Since medical care is likely to be purchased at the expense of non-food items, the budget shares become even larger. The subsidies amount to 2.3% of non-food expenditures for wealthy families and 5.2% poorer families.

For Peru the annual per capita subsidy to residents of wealthier villages such as our Coastal example is 30 intis, while the subsidy to residents of poor villages such as our example from the Sierra is 43 intis. This amounts to 1.2% of total consumption for the wealthier family and 4.5 of total consumption for the poor family. With respect to non-food expenditures, this amounts to 3.2% of the non-food budget for the wealthy families whereas the subsidy to the poor is about 18.7%. Our results can be summarized by pointing out the people who are willing to pay 2% to 3% of their non-food budget for medical care, but are not willing to pay 5% or more.

CHAPTER 8

Conclusion

8.1 Some Collaborative Evidence for the Main Results

The main analytical result of this study is that the demand for medical care is responsive to price changes. Moreover, the price elasticity of demand falls with income. The result that demand is price responsive is in accordance with most of the literature on developed countries as well as with a few recent studies on the developing world (Cretin et al., 1988; Alderman and Gertler, 1988 and Mwabu, 1988), but contrast sharply with earlier studies on the demand for medical care in LDCs. Indeed, a review of this early evidence on price responsiveness led to the conclusion that prices are not relevant in the decision to seek medical care (World Bank, 1987). In our review of the literature in chapter 5 we presented various reasons for this negative, and - given the evidence available from developed countries - paradoxal finding.

All studies mentioned, including our own, draw their conclusions from the statistical analysis of cross-sectional sample data. Observing the behavior of households and individuals who currently face different prices and other access costs, demand equations are postulated and estimated and the obtained coefficient for the price effect is statistically tested against the null-hypothesis of a zero price effect. Ideally, one would like to conduct various experiments in which alternative price regimes are being implemented and before and after utilization patterns compared. Given that this is

conceptually straightforward, the lack of such experiments is surprising. In fact, we were able to find just one study that reports on such a before and after evaluation.

Dr. Enyimayew, in a paper presented at the WHO Workshop on Financing Drug Supplies held in Zimbabwe March 1988 (Enyimayew, 1988), reports results from the Ashanti-Akim experience in Ghana. After the introduction of user fees in 1985, attendance dropped to one-quarter of the previous level. In the larger urban-based health stations attendance recovered quickly, but 2½ years after the introduction of user fees, small rural based stations that serve primarily the poor see only a fraction of the patients they saw before and operate at less than half of their optimum level (op. cit. p.11-a). This result is strikingly similar to the simulation results presented in Chapter VII: user fees can be introduced in relatively well-off regions without having a major impact on health-care utilization, but user fees will constitute an effective access barrier to medical care for the poor.

Other collaborative "real world" evidence for our analytical findings is more anecdotal. For instance, Dunlop in a study on Ethiopia reports that revenues for outpatient care actually decreased after a fee increase was implemented, implying that the price elasticity of demand exceeds - 1.0 in absolute value (Dunlop, 1987). However, this study also reports arc price elasticities of between .05 and .50, so the evidence is mixed, except for the fact that demand is sensitive to prices. Bao (1987) reports that about half of the ill peasants in Hubei Province, China, who do not obtain medical care, report the high price as the major deterrent. Two thirds of the poor in the mountainous areas say not to seek care because the price is too high.

In sum, we are quite confident that our main findings are correct and should be taken seriously by those who propose to charge user fees as a means of generating revenues for health-care delivery. At the end of this chapter we will summarize the policy implications of our findings. But first we will draw attention to some of the shortcomings of our study and thus, inter alia, sketch an agenda for future research.

8.2 Suggestions for Future Research

The most obvious next steps necessary to improve our understanding of the determinants of the demand for medical care would involve an extension of the model we used into a more detailed investigation of the determinants of more specific aspects of health-care utilization. The extension is necessary since we restricted the analysis to the choice of provider only. It is conceptually straightforward to include the total number of visits, as well as outlays for follow-up consultations. We would also have liked to be more precise about the total access costs, including, for instance, out-of-pocket transportation costs. The data requirements for such an extension are large, but not prohibitively so. A carefully prepared household survey focusing on health and medical care utilization could incorporate questions to obtain such information.

It will be somewhat more difficult - but not less important - to become more specific about exactly what is meant by "the demand for medical care". For instance, the willingness to pay for preventive care is probably quite different from the willingness to pay for curative care. The price elasticity of drugs and the demand for care for chronic diseases will differ

from acute care, emergency care and for maternal and child health care. Our study focussed on the demand for acute primary outpatient care. Subsequent research should focus on specific types of medical care. This, by itself, does not cause any conceptual difficulties. It does imply, though, that much more attention needs to be paid to the measurement of health status. Self reported health status (days lost for normal activities due to an illness or injury) is likely to contain insufficient information if one is interested in explaining the choice between, say, visiting a mid-wife or a hospital emergency clinic.

Others would argue that health status should be treated as endogenous (e.g. Strauss, 1988). While this is theoretically correct, we did not find any impact on our estimation results when removing "endogenous" health status measures. Again, this issue may become very difficult to deal with empirically if health-care type specific demand equations are being estimated using illness specific health status measures. This analysis requires a longitudial design where patients are followed over time so that specific investments (use of medical care) can be evaluated on their effect on future improvements in health.

There are various aspects related to the main issue of health-care financing through user fees that we have not adequately addressed and that, we think, deserve high priority from the health-economic research community.

The first one relates to the effect of the quality of care (e.g. the amount of training received by the doctor; the availability of drugs and diagnostic equipment) on the demand for care. The demand equation may shift if the quality of the services provided increases. If such a shift is large enough, it may offset the negative effect on utilization of an increase in the

price of care. This is an empirical question that can and should be researched using provider-specific data in conjunction with household survey data.

The second issue relates to the responses of the private sector to pricing policies in the public health-care sector. As we demonstrated in the policy simulations for Peru, potential revenues for the public sector may "leak" to the private sector if fees for government clinics are raised. Though this is not necessarily a negative development (it may for instance free an over-burdened public sector to focus on providing care to the poor) it may have significant consequences in terms of revenues raised. A better understanding of the the private sector supply responses in the health-care sector (will the private sector increase its price in response to the increase in demand? Or will it expand its facilities?) is necessary to come to a more complete judgment about the feasibility of financing medical care through user changes.

Finally, we feel that much more work can be done to better target public health-care facilities to benefit the poor. Even in a relatively small country like Côte d'Ivoire, regional differences in welfare levels are relatively large. Given our simulation results, it does make sense to subsidize medical care in such areas as the Savannah in Côte d'Ivoire and the Sierra in Peru. At the same time user fees can be introduced in the better-off areas without large negative effects on utilization. If welfare differences are very large, some form of cross-regional subsidization may become a desirable and feasible option. But more can be done in this area.

One way to protect the poor is to provide them with health-insurance. Very little analytical work is being done in this area since

targetting the poor is very difficult without a reliable income reporting system, and these systems do not exist in many developing countries. But, for example, in countries where governments have created a monopoly on export crops grown by small farmers, one could think of earmarking a tiny percentage of the revenues of these crops for providing health-care insurance to these farmers. For the case of Côte d'Ivoire, this would especially be beneficial to a large group of the poor, if the emphasis was on cotton growers. Alternatively, just as one can think of regional variation in subsidizing health-care delivery, one can imagine region-specific (or even village-specific, say, based on export crop production) subsidies for health insurance schemes. Clearly, the ramifications of such policies need to be worked out further, but the examples suggest that there are many alternatives to the customary across-the-board subsidy schemes that, in practice, always turn out to be regressive. More analytical work in this area is needed, as well as more innovative real world experimentation.

8.3 Suggestions for Policy Implementation

We conclude by listing the four most important findings of our study and providing some suggestions on how - given these findings - user fee policies can be implemented while trying to protect the poor.

- the demand for medial care is price sensitive
- the poor are more price sensitive than the rich
- child care is more price elastic than adult care
- alternative health-care providers are closer substitutes than health-care providers and self-care.

Do these results imply that user fees should not be introduced as a source of revenues for the health-care sector? Not at all. Demand overall is price inelastic with an order of magnitude about -.2 to - .4, implying that increases in prices will raise substantial revenues. In addition, there are many good reasons other than resource mobilization for reintroducing price signals in the health-care system (e.g. World Bank, 1987). What the results imply is that just as providing medical care free of charge to the entire population is an unattainable and regressive policy, so will the across-the-board introduction of user fees be regressive and - in poor areas - unattainable.

The first result, that the demand for medical care is responsive to price changes, has straightforward implications for revenue potential: since the demand for medical care will fall if prices are raised, revenues will be lower than without a price response. This is particularly the case if there are close substitutes for public facilities (private care).

The second result implies that the revenue potential in poor areas is very low. Clinics in poor areas can not survive financially unless they are heavily subsidized. The poor's willingness-to-pay for medical care is so low that they are effectively being priced out of the market by fees that are even just a fraction of marginal costs. Our results indicate that fees can be charged without a significant drop in utilization if the cost of medical care takes no more than 2 to 3 percent of the household's non-food budget. Though we are hesitant to prescribe this number as a rule of thumb, it does suggest that the estimated budget share for medical care can give a first indication about the feasibility level of user fees. The practical implication of these results is that uniform user fees are regressive and that some sort of price

discrimination is necessary to simultaneously achieve cost-recovery and equity goals. In countries without good income records, targetting the poor for price discounts is administratively difficult. One immediate alternative is geographic price discrimination: Charge lower prices for facilities that primarily serves low income groups. In addition, policy makers may want to opt for the gradual introduction of user fees, starting at a level that will result in expenditures of no more than about 2 percent of the household non-food budget. Careful evaluation of the changes in utilization patterns resulting from such charges should provide guidance for subsequent policies regarding the fee levels. Of course, such an approach implies that fees in poorer areas have to be set well below those in better-off regions.

If our third result, that child care is more price sensitive than adult care, holds up to further scrutiny, it contains again a strong warning against the across-the-board introduction of user fees. Clearly it would be penny-wise and pound-foolish for a developing country not to invest in the health of its younger generation. With human capital formation one of the driving forces of economic development, there is much to be said for providing medical care to children who need it. It would be logistically simple to exempt child-care from increases in the fee structure for medical care, or at least to differentiate between fees for child health-care and adult care. The humanitarian argument would make such a differentiation politically feasible. If our results turn out to be generally true, such a policy would also make good economic sense.

Our final result, that the increase in the price of one provider is more likely to lead patients to turn to another provider rather than to opt for self-care providers, provides another suggestion for a differentiated

introduction of user fees in the health-care system. The result suggest that one should start to charge for higher levels of care (say, hospitals). If, after the introduction of, or increase in fees, the demand for hospital care decreases significantly, while the demand for clinic care increases, any increase in the charge for clinic care is likely to result in an overall reduction of medical care utilization. If, on the other hand, the demand response to the hospital fee is modest, one can experiment with a gradual introduction of fees in the lower echelons of the health-care system.

The overall message to policy makers is thus one of gradation and differentiation. The best policy advice will be derived from carefully monitoring the impact of real world experiments. The selective introduction of modest fees, followed by a careful evaluation of the resulting changes in health-care utilization patterns, will provide the policy guidance for subsequent fee policy measures or for corrective actions.

In the early chapters of this book we underscored the importance of health in the development process. We highlighted the poor state of the existing health-care infrastructure and joint the numerous analysts and policy makers who point at the need for more financial resources to improve the situation. Given the current economic climate and the tight fiscal policies many LDCs have to follow to return to a path of sustained economic growth, additional financing is unlikely to come from government resources. Are user fees the answer? This study has shown that, in general, user fees can generate significant revenues, if introduced carefully. The best policy is likely to be one that starts with charging modest fees for higher level care. Fees approaching the marginal cost of care, however, will effectively

cut the poor out of the health-care market. Thus, large subsidies continue to be necessary for providing medical care to the poor.

In the past many countries have opted to eliminate all financial barriers to obtaining medical care. This has lead to a resource-starved health-care system in which the limited supply of services is rationed by non-price mechanisms. In spite of all the good intentions, the result is a highly inequitable, regressive distribution of public health services. User fees can significantly increase the resources necessary for improving the health-care system. If these fees are introduced in a differentiated way, the policy can at the same time generate revenues and improve the equity of the system. On the other hand, if no special measures are being taken, a user fee policy will perpetuate the inequitable distribution of health-care in the developing world.

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