A Guide to the Integration of Consumer Price Index (CPI) and International Comparison Programme (ICP) Production Activities[1]

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[1] This guide was prepared by Patrick Kelly, Statistics South Africa, and D.S. Prasada Rao, the University of Queensland, Australia, with case studies contributions from Dilip Kumar Sinha, Ministry of Statistics and Program Implementation, India; Merav Yiftach and Yoel Finkel, Central Bureau of Statistics, Israel; Lekau Ranoto, Statistics South Africa; and Sharne Bailey, Office for National Statistics, United Kingdom. Nada Hamadeh, Marko Rissanen, William Vigil Oliver and Elizabeth Purdie, World Bank, provided inputs to this work. The guide was reviewed by the Inter Secretariat Working Group on Price Statistics (IWGPS) and International Comparison Program (ICP) Inter-Agency Coordination Group.

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Abbreviations

BNR	brand not relevant
CPD	country-product-dummy method
CPI	Consumer Price Index
GTIN	Global Trade Item Number
ICP	International Comparison Program
NSO	national statistical office
PPP	purchasing power parity
SAF	spatial adjustment factor
SDG	Sustainable Development Goal
SPD	Structured Product Description
SVC	statistical value chain

1. Background

The International Comparison Program (ICP) is one of the world's largest statistical initiatives and one of the most enduring, having celebrated its 50th anniversary in 2018. The ICP is carried out under the auspices of the United Nations Statistical Commission (UNSC) and managed by the ICP Global Office at the World Bank. The regional implementing agencies coordinate the regional ICP programs while the national implementing agencies are responsible for planning and implementing ICP activities at the country level, including carrying out price surveys and compiling the national account expenditure data. These stakeholders work within the ICP governance framework[2], which aims to ensure that the global, regional, and national efforts to produce reliable PPP estimates and related measures of real expenditures adhere to approved policies, protocols, methodologies and quality assurance standards, and that the estimates are produced efficiently in keeping with available resources.

The results of the most recent ICP 2017 cycle covering 176 economies were released in May 2020. The ICP 2017 cycle delivered a comprehensive set of robust and high-quality results, strengthening data quality assurance approaches and providing a fully documented and transparent process for computing results at the global level, whilst maintaining methods and processes consistent with the previous ICP 2011 cycle.

Nonetheless, the sustainability of ICP as a global statistical program remains a concern to the UNSC and other stakeholders. At the conclusion of the forty-seventh Session in 2016, the UNSC resolved that the ICP be a "permanent element of the global statistical programme to be conducted at more frequent intervals." The Commission agreed "with the proposal to adopt a rolling survey approach[3] spread over a three-year cycle, starting in 2017, which would allow flexibility in conducting the surveys according to the specific conditions of the participating countries."[4] The UNSC has further urged participating countries to integrate and harmonize ICP activities with their regular work program, especially the Consumer Price Index (CPI), to ensure a sustainable and a truly permanent ICP. Furthermore, the UNSC constituted the Friends of the Chair (FOC) group to conduct an evaluation of the ICP 2011 cycle. Along with a host of recommendations, the FOC noted that the

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[2] http://pubdocs.worldbank.org/en/255521487200449880/ICP-GB01-Doc-Governance-Framework-Final.pdf

[3] The rolling survey approach over a three-year cycle requires the adoption of a rolling price surveys, whereby the participating economies collect prices of one-third of the items included in the household consumption product list in each year over a three-year cycle. For example, comparisons for the benchmark year 2024 would make use of prices of one-third of the items collected in each of the years 2023, 2024 and 2025. Using the closest related and most detailed component of CPI, item-level prices in 2023 are extrapolated whereas prices in 2025 are retropolated to the benchmark year, 2024. The feasibility of implementing rolling price survey approach hinges critically on the availability of reliable measures on price changes over time at a disaggregated level and that are closely aligned with the ICP framework for PPPs.

[4] Names of the organizational units and technical terms have been harmonized in this document, including direct quotes from existing reports, papers and documents.

integration of the ICP and CPI activities at the country level can lower the overall costs of the ICP, as well as enhance the quality, coverage and reliability of the generated price comparisons for the household consumption components of ICP.

The ICP Global Office at the World Bank considered the FOC recommendations and, in response, prepared a research agenda[5] to guide its immediate and longer term ICP activities. This agenda includes an item to conduct research on harmonizing ICP and CPI activities,[6] in order to identify synergies between the two programs and lessen the data collection burden on economies participating in the ICP. Subsequently, the ICP Global Office established a Task Force on *Country Operations and Guidelines*[7], which was entrusted with the preparation of a guide on CPI-ICP integration[8].

Concurrently, there have been developments on subnational purchasing power parities (PPPs). The World Bank in its submission to the forty-seventh Session of the UNSC indicated: "To meet the growing demand for official estimates of PPPs at the subnational level, selected countries in various regions have undertaken the compilation of subnational PPPs in the interim period. The ICP Global Office, in collaboration with the regional implementing agencies, is compiling an inventory of subnational PPP projects and exploring future expansion and harmonization of these exercises to maximize synergies and comparability." Recognizing the importance of subnational PPPs, the Task Force on *Country Operations and Guidelines* was asked to prepare a guide on subnational PPPs. As subnational price comparisons complement the CPI, which is a measure of price changes over time, the success of any such program would rely heavily on the inter-relationships between CPI and subnational PPP compilation.

In view of these developments and the increasing reliance of the ICP on the availability of reliable and timely CPI measures at a disaggregated level, there is a need to examine and consider a closer integration of CPI and ICP related activities at the national level. This guide is designed to serve this purpose.

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[5] http://pubdocs.worldbank.org/en/774201507663170526/pdf/ICP-GB02-Doc-ICP-Research-Agenda.pdf

[6] https://www.worldbank.org/en/programs/icp/brief/ra07

[7] Prasada Rao, University of Queensland; Brian Graf, International Monetary Fund; David Roberts, Independent Expert; Dilip Kumar Sinha, India Ministry of Statistics and Program Implementation; Levan Gogoberishvili, International Monetary Fund; Luigi Biggeri, University of Florence; Majed Skaini, United Nations Economic and Social Commission for Western Asia; Patrick Kelly, National Statistical Office of South Africa; Yuri Dikhanov, World Bank; William Vigil-Oliver, World Bank.

[8] http://pubdocs.worldbank.org/en/307141510262316507/pdf/ICP-TF-OGP01-Doc-TOR.pdf

2. About this guide

The primary audience for this guide is producers of official statistics and, in particular, price statistics units in national statistics offices (NSOs) who are charged with collating national CPIs and their country's contribution to the ICP. Price statisticians in developing countries where dedicated resources for the sustained collection of ICP data are scarce, if not readily available, will benefit most from this guide. Furthermore, the guide will provide all users of official statistics with a good understanding of CPIs and the ICP and their differences and similarities.

The approach taken in this guide is to identify potential points of the CPI survey process where ICP activities can be incorporated, and to illustrate how the ICP requirements for item identification and price collection can be satisfied by improving and standardizing the description of CPI specifications. However, price statisticians should be mindful of not compromising the accuracy and representativity of the CPI when considering new approaches.

This guide draws on the new CPI Manual: Concepts and Methods (IMF et al, 2020, and hitherto referred to as the "CPI Manual"), [9] published by the member agencies of the Inter Secretariat Working Group on Price Statistics, [10] and adopted by the United Nations Statistical Commission in March 2020. The CPI Manual includes many practical suggestions which should form the foundation for incorporating ICP requirements into CPI processes, and Appendix 5 of the CPI Manual is dedicated to an explanation of ICP methods and a summary of the benefits of CPI and ICP integration.

The following chapters in this guide review the similarities and differences of national CPIs and the ICP (Chapter 3); the benefits arising from efforts to integrate the two exercises (Chapter 4); the current level of integration in ICP participating countries (Chapter 5); where integration can take place in the statistical value chain, the classification and hierarchies of products, and the use of Structured Product Descriptions (SPDs) in identifying products to be priced in both the ICP and CPI (Chapter 6); the use of scanner data and web-scraped prices for CPIs and the ICP (Chapter 7); the treatment of housing and dwelling services data (Chapter 8); and conclusions and next steps (Chapter 9). Furthermore, the CPI-ICP integration survey sent to countries is provided at Appendix A, and a set of national case studies illustrating the ambitions, successes, and challenges that countries have encountered in pursuing the integration of CPI and ICP activities is presented in Appendix B.

[9] www.imf.org/en/Data/Statistics/cpi-manual

[10] International Labour Office (ILO), International Monetary Fund (IMF), Organisation for Economic Co-operation and Development (OECD), Statistical Office of the European Union (Eurostat), United Nations Economic Commission for Europe (UNECE), and the World Bank.

3. CPI and ICP: Similarities and differences

PPPs, as calculated by the ICP, and CPIs share conceptual similarities. A national CPI measures the relative change over time in the prices of goods and services within a country, whereas the ICP's PPPs measure relativities in prices, denominated in local currencies, across countries at a given point of time, and thus provide a spatial comparison. Therefore, the CPI and PPPs facilitate, respectively, temporal and spatial measures of price change. It is also important to emphasize that national CPIs and the ICP's PPPs are different, not only in time-space dimensions, but also in scope. A national CPI covers consumer goods and services purchased by households, while the ICP covers the whole expenditure side of GDP, and its analytical components, including household consumption. Furthermore, subnational PPPs can be constructed by comparing prices across regions and locations within a country in the same period.

National CPIs are some of the most important economic indicators and are compiled and disseminated, on a regular basis by NSOs or other producers of official national statistics around the world. CPIs have a long history and Chance (1966) reviews the emergence of the concept of price indices from the 1600s onwards including William Fleetwood's measure of price change in 1707. The Laspeyres index developed in 1871, and its derivatives, is still one of the most widely used index number formula which, in concept, measures the change in the cost of a fixed basket of commodities in the reference period had that same basket been purchased in any succeeding or preceding periods. The CPI Manual discusses the types of index used in the compilation of CPIs including the Lowe index, the Young index, and modified versions of these. In addition to being used as a macroeconomic measure of inflation for a given country, CPIs serve as key inputs into monetary policy decisions and play a prominent role in monitoring the effects of government policies. In addition, the CPI is used to index monetary payments, including salaries and wages, to ensure compensation adequately reflects changes in the cost of living, government payments such as social security and rent contracts, and other payments. The CPI also provides the general public with a measure of changes in the prices of goods and services consumed. CPI compilation methods continue to evolve over time to reflect improvements and innovations to data sources and collection methods, index calculation formulas, and user needs. Current recommendations and best practices are outlined and discussed in the CPI Manual.

PPPs are both currency conversion factors and spatial price indexes. They are calculated based on prices for a common basket of goods and services in each participating economy. They convert different currencies to a common currency and, in the process of conversion, equalize their purchasing power by eliminating the differences in price levels between economies. They show, with reference to a base economy, the relative price of the given basket of goods and services in each of the economies being compared.

PPPs, as measures of spatial price level differences, are a relatively new development that can be traced back to Gilbert and Kravis (1954) and the pioneering efforts of Kravis in establishing the International Comparison Project (ICP) at the University of Pennsylvania in 1968, as a research program in collaboration with the United Nations Statistical Division (UNSD). The ICP has grown from

a small research project covering ten countries in 1970 into a global statistical initiative with 176 economies fully participating in the ICP 2017 cycle, and was instituted by the UNSC as a permanent element of the global statistical work program at its 47th session in 2016. The ICP website[11] provides a wealth of information on the concept, calculation and use of PPPs, as well as the history and governance of the program. Furthermore, the World Bank (2013) publication "Measuring the Real Size of the World Economy: The Framework, Methodology, and Results of the International Comparison Program (ICP)",[12] provides a comprehensive overview of the compilation of PPPs and the World Bank (2015) publication "Operational Guidelines and Procedures for Measuring the Real Size of the World Economy 2011 International Comparison Program"[13] provides detailed guidelines on the operational aspects of ICP.

Despite conceptual similarities and closely related data collection requirements, historically there has been very little harmonization of the national CPI and PPP compilation activities of national statistical offices with the two measures typically constructed under different production infrastructures. However, this has started to change recently, and this guide aims to identify the practical steps that can be taken to integrate collection of consumer prices for both activities. Achieving this is vital to the sustainability of the ICP as a permanent UN exercise and key to improving the accuracy of national CPIs. In this way the ICP and CPI data collection processes can be seen as symbiotic – working together to improve and sustain each other.

The challenge of CPI-ICP integration is to incorporate elements of the ICP methodology that will enhance the quality of the national CPI while not compromising the objectives, representativity, and reliability of the CPI. In addition, meeting this challenge, and successfully integrating parts of the two processes, will create an ideal data set for the computation of subnational PPPs.

4. Benefits of CPI-ICP integration

Similarities in the conceptual and operational aspects that underpin CPI and PPP compilation are indicative of significant synergies and benefits from an integrated approach to these two activities. It is important to recognize the dual nature of the integration process which can simultaneously benefit both programs, resulting in improvements in CPI compilation and at the same time contributing to the sustainability of international price comparisons.

[11] icp.worldbank.org
[12] https://www.worldbank.org/en/programs/icp/brief/2011-icp-book
[13] https://www.worldbank.org/en/programs/icp/brief/2011-operational-guidelines

Benefits for the CPI

There are significant benefits to NSOs adopting an integrated approach to the compilation of CPI and PPPs for ICP. In the case of developing countries with limited statistical infrastructure, integrating the activities of the ICP with those of the CPI can provide an opportunity for NSOs to maximize efficiencies and make the case for additional resources to support both programs.

- Participation in the ICP can help strengthen statistical infrastructure and enhance institutional capacity. Participation in the ICP is likely to identify deficiencies which can help improve management and planning functions such as the recruitment and training of new staff for conducting general price surveys as well as household expenditure surveys. Furthermore, the validation procedures used by the ICP can be utilized to improve the quality of national statistics.
- Participation in the ICP will require a review of data collection methods and index processing systems, and this review could identify areas for improvement. Designing and conducting sample surveys to international standards can be a demanding exercise. Participating countries may need to develop systematic plans to augment CPI survey designs to integrate the ICP to meet the needs of both programs, without compromising the quality of either.
- Computerized data-processing systems may need adaptation and enhancement to incorporate ICP specifications. The adoption of detailed ICP specifications into CPI necessitates a computerized data processing system in order to accommodate more information. The process may speed up the adaptation of similar computerized data processing systems to CPI.
- As the ICP is a highly structured and harmonized activity, participation in the ICP could potentially encourage the implementation of harmonized CPI methods at the regional level.
- The framework for the ICP may be adapted for making price level and PPP-based income and expenditure comparisons across areas and regions within a country. There is growing demand for subnational PPPs which can help assess the levels and movements of real incomes and consumption in different regions. Intra-country price comparisons are helpful in monitoring progress towards the United Nations Sustainable Development Goals (SDGs) and monitoring the incidence of poverty in different parts of the country.

Benefits for the ICP

Conducting the ICP can be challenging for participating countries because NSOs traditionally face budgetary and human resource constraints. ICP-related activities are typically considered secondary and are over and above the regular activity of compiling the national CPI and National Accounts. Meeting the requirements of the ICP and adhering to schedules for the collection and provision of reliable price data may stretch the limits of those departments involved in these activities. The dependence of many countries on additional funding needed to participate in the ICP, specifically

regarding the collection of price data, is a major challenge to the sustainability of the ICP. It is in this context that the benefits of integrating ICP and CPI activities should be considered.

- The absorption of ICP activities into the mainstream CPI activities of NSOs will help to ensure the allocation of national resources for the ICP and may provide an opportunity for NSOs to request additional resources for both exercises. This, in turn, will help to sustain the ICP globally and result in a more enthusiastic participation by countries in the ICP.
- As the ICP strives to increase the frequency of its benchmark comparisons or cycles by adopting a rolling price survey approach, the program will depend on reliable estimates of domestic inflation for major household consumption categories.[14]
- Domestic rates of inflation based on the CPI and for broad categories of household consumption can be used to validate price data collected for the ICP in different cycles. The implied inflation rates for common items in two consecutive ICP cycles can be assessed against domestic inflation in the closest related component of CPI. The deviations in the directions and magnitudes between the inflation rates in ICP and in CPI can be informative in validating price data collected for the ICP.
- The quality of ICP data is likely to be improved if price surveys for the ICP are integrated with CPI price surveys. The expertise of CPI price collectors, especially on the familiarity of local markets, is likely to improve the quality and reliability of prices collected for the ICP.
- The CPI basket of goods and services may be used to identify ICP products that are "representative" or "important" for a given country. The current ICP methodology accords higher weights to prices of products that are deemed to be important.
- The integration of ICP price surveys with those of the CPI would maximize efficiencies and may result in budgetary savings in staff, costs, and resources.
- The ICP relies on national accounts expenditures for the benchmark year as weights in the computation of PPPs. Expenditure weights for household consumption aggregates are usually based on CPI weights which are compiled using data from household expenditure surveys.

The potential benefits stemming from the increased integration of CPI and ICP activities discussed above are at the core of the recommendations made in this guide.

5. Current level of integration of CPI-ICP activities

As part of the preparations for this guide on CPI-ICP integration, it was necessary to first gauge and understand the level of integration currently achieved in countries that are actively participating in the ICP. After deliberations of the Task Force assigned with the drafting of this guide, and the

[14] Both the CPI and the ICP use the Classification of Individual Consumption by Purpose (COICOP).

subsequent endorsement by the ICP Technical Advisory Group (TAG), it was decided to conduct a survey, using a short questionnaire (in Appendix A), of the current state of CPI-ICP integration in 2018 and 2019. The survey was administered through the national implementing agencies of the participating economies in the ICP 2017 cycle[15]. The questionnaires were sent via email and the response rate was 67 percent with responses received from 111 countries. The distribution of responses by regions is shown below in Table 5.1.

Table 5.1: **Distribution of responses to questionnaire, by ICP region**.

	No. of responses	Response rate
Total	**111**	**67%**
Africa	22	44%
Asia and the Pacific	22	100%
CIS	8	100%
Eurostat	24	65%
Latin America and the Caribbean	24	67%
Western Asia	11	92%

An important factor in the integration of CPI and ICP activities is the frequency of price collection[16]. If frequencies for these price collections are similar, integration may be easier to achieve. The survey finds significant differences in the frequency of price collection for CPI and ICP. As expected, CPI price collection mainly carried out on a monthly basis, whereas the ICP price collection takes place either monthly or quarterly (Table 5.2).

Table 5.2: **Frequency of price collection.**

	CPI	**ICP**
Total	**111**	**111**
Monthly	106 (95%)	41(37%)
Quarterly	2 (2%)	51(46%)
No response	3	19

[15] Results of this survey are show as per the ICP administrative regions.

[16] For ICP, this refers to the frequency of price collection during a reference or benchmark year, expect for the Eurostat-OECD PPP Programme that relies on the rolling survey approach.

Around 65 percent of responses indicated that different forms are used for CPI and ICP price collection (Table 5.3). Product specifications used in the ICP forms are detailed and based on Structured Product Descriptions (SPDs),[17] which are not generally used for CPI price collection.

Table 5.3: **Is the same form used for CPI and ICP price collection?**	
Total	**111**
No	71 (64%)
Yes	31 (28%)
No response	9 (8%)

One of the main reasons for not using the same form for both exercises is due to differences in the product lists used for the CPI and the ICP. The responses summarized in Table 5.4 show that the average reported overlap between the CPI and ICP baskets is as low as 33 percent with a high 25.7 standard deviation. Four responding countries reported no overlap between the ICP and CPI baskets. These responses need to be cautiously interpreted due to possible measurement errors arising out of misinterpretation of the question. As the ICP lists at the regional level are constructed with active input from participating countries, it is very unlikely that there is zero overlap between the ICP and CPI baskets. It is possible that a response of no overlap could mean that no prices collected for CPI were used for ICP, or the ICP items' specifications are too narrow that they do not exactly match with those in their corresponding CPI baskets.

Table 5.4: **Percentage of ICP products included in the CPI basket.**	
observations	94
min	0%
max	85%
Mean	33%
Median	32%
Standard deviation	26

There are encouraging indications of the integration of price collection activities for the CPI and the ICP (Table 5.5) with 30 percent of respondents indicating that these two surveys are conducted at the same time, and another 32 percent indicating that the timing of surveys is synchronized for collecting prices for items that overlap between CPI and ICP baskets. A possible explanation for 36

[17] Structured Product Descriptions (SPDs) are generic descriptions of items included in the ICP basket for price surveys. The SPDs are essentially a list of price-determining characteristics relevant to a particular narrow cluster of products.

percent of the responding countries indicating separate times for ICP and CPI price collection may be due to differences in the frequency of price collection. Responses on the frequency of price collection showed that 95 percent collected CPI prices monthly whereas only 37 percent collected ICP prices on a monthly basis (Table 5.2).

Table 5.5: **Is price collection for the CPI and ICP carried out at the same time?**

Total	**111**
Yes	33 (30%)
No	40 (36%)
Only overlapping items	36 (32%)
No response	2

Turning to data validation, editing and processing activities, there are encouraging signs of CPI-ICP integration. Table 5.6 shows that around 40 percent of the responding countries use the same data processing system to capture data ("yes" + "only overlapping items"), but 60 percent of countries currently do not.

Table 5.6: **Do the CPI and ICP use the same computer system to capture data?**

Total	**111**
Yes	24 (22%)
No	62 (56%)
Only overlap	23 (20%)
No response	2

Table 5.7 shows that 40 percent of countries indicated that they use the same editing procedures for their CPI and ICP, and an additional 20 percent indicated that they use the same procedures for analyzing price data for overlapping items. As editing procedures used for ICP are specifically devised for validating cross-country data, it is interesting that these methods are being applied in the CPI in 60 percent of the countries.

Table 5.7: **Do the CPI and ICP use the same editing procedures?**

Total	**111**
Yes	46 (41%)
No	41 (37%)
Only Overlap	22 (20%)
No response	2

Sixty-nine of the responding countries indicated that ICP validation procedures have helped in processing CPI price data, some significantly and others to a lesser degree (Table 5.8). The countries where ICP validation procedures have played an important role are mainly from Africa, Asia and the Pacific, and to a lesser extent from Latin America and the Caribbean and Western Asia. These responses suggest that participation in the ICP has contributed to statistical capacity building in many countries with respect to the editing and validation of CPI price data.

Table 5.8: Do ICP validation procedures help with the processing of CPI data?

	Yes, significantly	*Yes, somewhat*	*No*
Total	25	44	39
Africa	9	8	5
Asia and the Pacific	9	11	2
CIS	0	3	5
Eurostat	0	6	16
Latin America and the Caribbean	2	12	9
Western Asia	5	4	2

More than half of responding countries indicated that ICP staff are drawn from the staff dedicated to CPI compilation (Table 5.9). An additional 27 percent of the countries indicated an overlap between ICP staff and CPI staff.

Table 5.9: **Are ICP staff a subset of CPI staff?**

Total	**111**
Yes	59 (53%)
No	20 (18%)
Some are and some not	30 (27%)
No response	2

Finally, 65 percent of the countries have plans to improve CPI-ICP integration in the future (Table 5.10). Out with the Eurostat-OECD PPP Programme, 64 out of 84 countries in the remaining regions indicated plans for further integration of the CPI and ICP programs.

Table 5.10: **Does your organization have plans to improve CPI-ICP integration?**		
	Yes	*No*
Total	**69**	**37**
Africa	15	6
Asia and the Pacific	18	4
CIS	3	5
Eurostat	5	17
Latin America and the Caribbean	18	5
Western Asia	10	0

In summary, responses from ICP participating countries show some signs of CPI-ICP integration and indicate plans for further integration of CPI-ICP activities. The contents of this guide are expected to help these and other countries to achieve higher levels of CPI-ICP integration thereby benefiting from synergies and enhanced efficiency in the compilation of CPI and PPPs.

6. The Statistical Value Chain as a basis for CPI-ICP integration

A systematic approach to identifying areas of possible alignment and integration is to use the statistical value chain (SVC), which is also known as the statistics lifecycle, statistical process model, or data value chain.[18] The SVC details the generic sequence of steps required when undertaking a statistical activity and is comprehensive in scope, covering all possible elements of a process.

The main headings applicable to the practical aspects of integrating ICP and CPI activities are highlighted in Figure 1 and are expanded on below.

Design refers to the initial conceptualization and setup of the survey. For repetitive surveys such as price collection, design takes place on initiation of the activity and again only when improvements are planned. A large proportion of this guide is dedicated to the design phase as it is here that much of the effort is required.

Collection refers to the physical activities involved in recording data including the planning of price collection, the training of collection staff, and first line quality assurance processes. The standard SVC sample selection step forms part of the collection phase; however, in this guide it is covered under *Design* as product identification and the respective specifications are central to the overall conceptualization of integrated price collection.

The *Processing and Editing* phase refers to activities such as the editing and validation required to clean the data so that they are fit for analysis.

[18] See https://opendatawatch.com/publications/the-data-value-chain-moving-from-production-to-impact/ for a detailed explanation on statistical value chains.

Figure 1: Statistical value chain

6.1 Design

6.1.1 Classification

Key recommendation: COICOP classification and hierarchy should be consistent for ICP and CPI products.

The Classification of Individual Consumption According to Purpose (COICOP classification), which was updated in 2018, forms the basis for organizing product data in both the CPI and ICP. Compliance to the international high level COICOP structure by countries facilitates CPI-ICP integration as well as comparisons of national CPIs.

The official COICOP manual[19] defines the product hierarchy down to the level of a subclass, for example, "bread and bakery products". Many countries create further levels themselves, the first of which is the micro-class which is equivalent to the ICP's basic-heading level. Typically, expenditure data at this level can be used to develop more detailed elementary aggregates in the CPI (for example "bread") than the subclass identified by COICOP. It is important for ICP purposes that the lowest, or most elementary aggregated, level used in the CPI can be mapped to the ICP basic headings. It should be noted, however, that the elementary aggregate level differs from country to country based on the availability of data, and many countries lack the data needed to develop weights at such a detailed level.

Table 1 shows the levels of the classification hierarchy in the new COICOP version, a typical CPI breakdown, and the ICP hierarchy. This table helps readers to understand the terminology employed by both the CPI and ICP as well as in this guide. The formal COICOP classification only goes to the level of class (COICOP 1999) or micro-class (COICOP 2018). It is important to note that the term "item" is used to describe the lowest level of classification at which the CPI typically, though not always, has expenditure weights. This is the elementary index level which corresponds to the basic-

[19] https://unstats.un.org/unsd/classifications/business-trade/desc/COICOP_english/COICOP_2018_-_pre-edited_white_cover_version_-_2018-12-26.pdf

heading level. The term "variety" is used to refer to the actual product in a specific store that is being priced.

Table 1: COICOP, CPI and ICP hierarchy[20]

Hierarchy			Examples		
COICOP 2018	**CPI**	**ICP**	**COICOP 2018**	**COICOP 1999**	**ICP**
DIVISION	**DIVISION**	**CATEGORY**	**FOOD AND NON-ALCOHOLIC BEVERAGES**	**FOOD AND NON-ALCOHOLIC BEVERAGES**	**FOOD AND NON-ALCOHOLIC BEVERAGES**
Group	**Group**	**Group**	**Food**	**Food**	**Food**
Class	Class	Class	Cereals and cereal products	Bread and cereals	Bread and cereals
Subclass	**Subclass**	**…**	**Bread and bakery products**	**…**	**…**
	Micro-class	Basic heading	Bread	Bread	Bread
	Item	Item	Loaf of white bread	Loaf of white bread	Bread loaf, white, Brand not relevant
	Variety	…	*X brand in y outlet*	*X brand in y outlet*	…

COICOP 2018	CPI	ICP	COICOP 2018	COICOP 1999	ICP
DIVISION	**DIVISION**	**CATEGORY**	**CLOTHING AND FOOTWEAR**	**CLOTHING AND FOOTWEAR**	**CLOTHING AND FOOTWEAR**
Group	**Group**	**Group**	**Clothing**	**Clothing**	**Clothing**
Class	Class	Class	Garments	Garments	Garments
Subclass	**Subclass**	**…**	**Garments for Women or girls**	**Garments for women**	**…**
	Micro-class	Basic heading	Women's shirts, blouses, pullovers, sweaters, etc	[Women's skirts and dresses]	Garments
	Item	Item	Women's shirt	Women's skirt	Women's pullover, well-known brand, low
	Variety	…	*X brand in y outlet*	*X brand in y outlet*	…

[20] The CPI examples in this table assumes the country in question has an elementary aggregate or "item" of "Loaf of white bread". However, the level of elementary aggregates can vary between countries.

6.1.2 Specifications

Key recommendation: The concept of Structured Product Descriptions (SPDs) can guide CPI compilers to ensure the development of detailed and complete variety specifications that support both CPI and ICP needs.

The list of product specifications to be recorded is crucial for price data collection and forms the basis for most of the recommendations in this guide. Product specifications are the item characteristics that influence the price of the item (price-determining characteristics). These appear as a set of fields in a questionnaire or database in which information is recorded, each field having a either a predetermined range of responses (for example, Yes/No) or rules that govern the information to be recorded.

The product specifications describe the observable price-determining characteristics that need to be matched when a variety of an item is selected to be priced. The benefits of this approach includes the following:

- a detailed description of each collected variety enables confirmation that the priced variety meets the parameters of the elementary index level product;
- a detailed description provides adequate information for the price collector to find precisely the same variety at the subsequent collection period, usually a month later; and
- a detailed description can also include multiple fields covering different aspects of the product which allows a greater range of data for comparison and analysis purposes.

The CPI Manual refers to tight and loose specifications of product or item varieties. Tight specifications better facilitate the calculation of average prices and ensure comparability of items across countries, which is the aim of ICP price collection. Accordingly, the ICP stipulates strict requirements for the selection of items for pricing. These may include restricting the choice of brand or the size of an item by weight, volume, or quantity for example. For the CPI, tight specifications tend to be useful for electronic and other items with high rates of turnover.

Loose specifications ensure that the CPI variety sample broadly reflects differences in regional tastes and preferences, as well as differences due to socioeconomic factors. As noted in the CPI Manual, individual varieties sold differ from outlet to outlet, and region to region, and the CPI should reflect these differences. In general, loose specifications can be useful for food, beverages, clothing, and personal items.

With loose specifications, the price collector applies a set of rules to identify a representative variety within the sampled outlet the first time the variety is selected for pricing. Typically, these rules are aimed at identifying the 'volume seller' within certain parameters, that is the most popular variety. Adequate descriptive information must be recorded to ensure the identical variety is priced in subsequent periods.

National CPIs vary in the extent to which item selection is prescribed through loose or tight specifications. In some countries, all descriptive characteristics are captured in only one or two fields,

which may facilitate the future identification of the variety for price collection. However, such a loose specification may capture a widely varying set of items and prices, reducing the data's usefulness for analysis and the calculation of average prices. It is critical that the detailed specifications include all price-determining characteristics.

The CPI can potentially benefit from the characteristics used to define items in the ICP to ensure sufficiently detailed variety specifications are used in the price collection forms and captured in the recording database. However, it should be noted that while tight specifications are appropriate to the ICP as the price collector is directed to a specific variety, looser specifications for the CPI can provide a more broadly representative index. In cases where an ICP item is not already included in the CPI list, the CPI variety sample can be augmented to include ICP items. Care must be taken, however, to ensure that these additional varieties are representative from the perspective of the CPI, or they should be excluded from CPI calculation and sample design.

When using loose specifications, compilers should ensure that specifications include all price determining characteristics and provide additional fields to include other descriptors, as needed. This practice can improve the quality of the CPI by assuring the correct matching of item varieties and enable deeper analysis of price trends for quality assurance purposes. Providing more extensive descriptive variables will make it easier to observe whether a variety priced in the CPI is similar to an item in the ICP list.

The specifications required to define the characteristics will differ according to the type of product. The SPD approach used by the ICP provides an excellent standard for the coverage of specifications required for correctly describing an item to be priced. It also provides the range of options required by the ICP for precise identification and description, and greatly assists when changes or updates to items are required. Importantly, the specifications should map clearly to the fields used in the editing and imputation processes.

Standardized characteristics will vary by ICP basic heading. Using these standard characteristics, countries can include additional details on CPI data collection questionnaires. These can be presented either as tick boxes to mark whether a particular characteristic is present or not, or as open fields to record information about the characteristic. This will allow greater identification of the overlap between the ICP and CPI item lists.

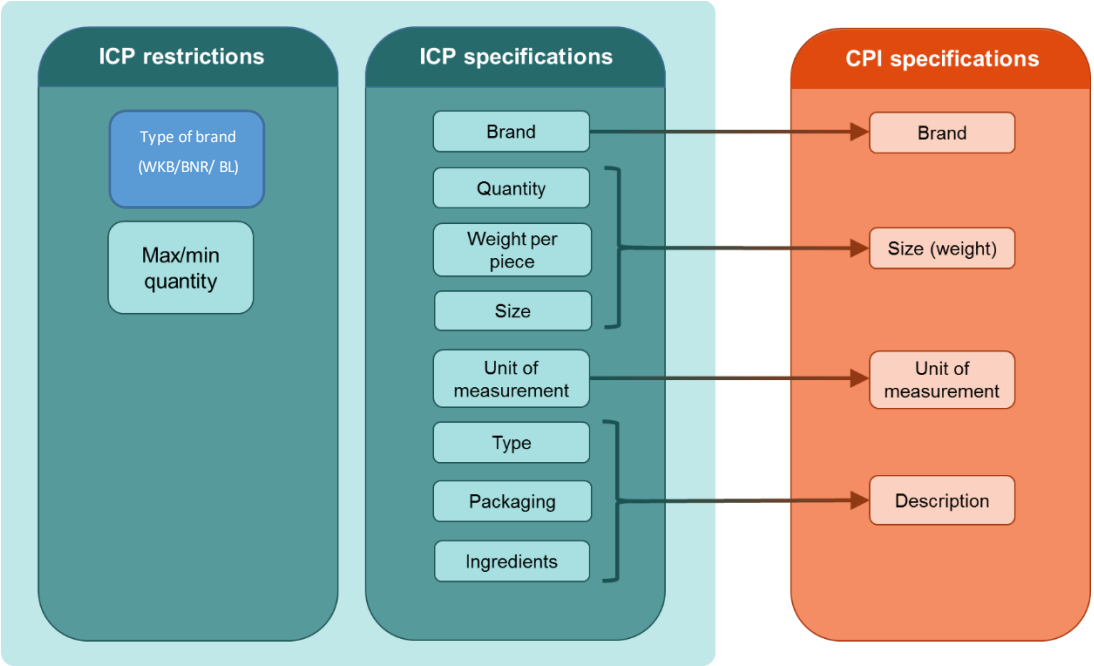
Where possible, a predetermined set of responses should be used to ensure consistency in recording characteristics. Where mobile devices are used in price collection, drop down lists could be created. Having more characteristics recorded is preferable, but this will depend on the resources and capacity of the NSO.

Priority should be given to those price-determining characteristics that are essential for like-with-like price comparisons and which feature in the ICP validation process. Priority characteristics are:

- Brand
- Size/weight/quantity
- Unit of size

Figure 2 illustrates how specifications required for the ICP could be mapped to a smaller number of specifications in the CPI collection form, and how they could be used for reporting for ICP purposes. The column headed "ICP restrictions" represents the parameters determined by the ICP to ensure consistency across countries. ICP specifications are the details of the specific item to be priced as recorded on the SPD.

Figure 2: Mapping of ICP restrictions, variables, and CPI variables for Bread



Note: The "Brand" box in the second column may convey the impression that the ICP typically stipulates a specific brand to be priced. However, such cases are more of an exception than the rule. In most cases the ICP asks for items that are either a "well-known brand" (WKB), "brandless" (BL) or "brand not relevant" (BNR); this gives the country the flexibility to decide which brands to price, albeit within all other Structured Product Description (SPD) parameters.

6.1.3 Price collection forms

Key recommendation: CPI and ICP data should be recorded on the same price collection forms, which must contain all the specifications identified as necessary for both CPI and PPP compilation.

The contents of price collection forms should include the price-determining characteristics that have been identified. Neither the ICP nor the CPI Manual are prescriptive on the layout of price collection forms and whether they should be paper or electronic. Good practice principles in questionnaire design include: (i) ease of use; (ii) clarity in identifying the correct variety; (iii) adequate space to record information; and (iv) ability to extract information. The CPI Manual also provides an example of a price collection form which will enable CPI-ICP integration.

There should be no difference in the CPI and ICP collection forms and, ideally, there should only be one set of forms on which price data are recorded. In many cases, CPI collection forms are spreadsheets with all the information for each variety contained in a single row; however, this is not ideal for either the CPI or ICP as the forms may not contain all the fields needed for ICP collection. A review and redesign of forms will be required to improve CPI questionnaires and to describe the products to the standard required for the ICP. The layout of the form should incorporate the additional variables in a logical flow for recording, rather than being inserted as an 'add on'.

Increasingly countries are using mobile devices such as tablets to collect CPI data. These have the advantage of combining data collection and quality control. Data collection via mobile devices provides an opportunity to create standardized responses to each variable in the form of drop-down lists. This avoids differences in responses between data collectors and enables the inclusion of simple standards such as the word order of description and spelling. Such standardization will significantly reduce editing and validation efforts as well as improve the extraction of data.

Figure 3 provides an example of how the characteristics required for both the CPI and ICP can easily be incorporated into a single data collection form. As discussed earlier, the specific characteristics will differ according to the particular micro-class (CPI) or basic heading (ICP).

Figure 3: Example price collection form with necessary specifications for both CPI and ICP purposes

Prices for	*June 2018*			**Location**	*Megacity*									
Collection Date	*6 June 2018*													
Price collector	XXX			**Outlet**	*Super store*	**Type of outlet**	*Supermarket*							
Class	Bread and Cereals			**COICOP**	0111									
Item information						**Product description/presentation**						**Price information**		
Price number	*Basic heading*	*Item*	*Item code*	*Brand*	*Product name*	*Product code*	*Ingredients*	*Packaging*	*Further description*	*Size*	*Unit of size*	*Previous price*	*Current Price*	*Comments*
01	Bread	Brown bread	01113.1	Albany	Premium brown bread	01113.1.01	100 % wheat flour	Plastic bag	Red and blue colouring.	700	gram			
02	Other cereal	Cornflakes	01114.1	Kellogs	Kellogs corn fla	01114.1.01	Maize/ corn	Cardboard box	Picture of bowl with cereal and rooster.	500	gram			
03														
04														
05														
06														
07														

6.1.4 Sample design and selection

Price surveys require samples to be selected at four different levels. Each of these provide opportunities to integrate the ICP needs into the CPI data collection process.

- First, there is the item level which defines the set of representative products that make up the index.
- Second is the geographic sample which determines the areas where prices will be collected.
- Third is the outlet sample which identifies the specific stores or outlets where prices will be collected.
- Fourth, there is the sample of varieties, which form the actual survey data.

a) Product (item) list/basket

Key recommendation: The CPI basket should be used as the basis for the ICP product sample with the goal of minimizing the additional products needed for the ICP.

There are three product lists which impact the selection of products to be priced by each country for the ICP. They are:

- the national CPI basket
- the global ICP product list[21]
- the regional ICP product list

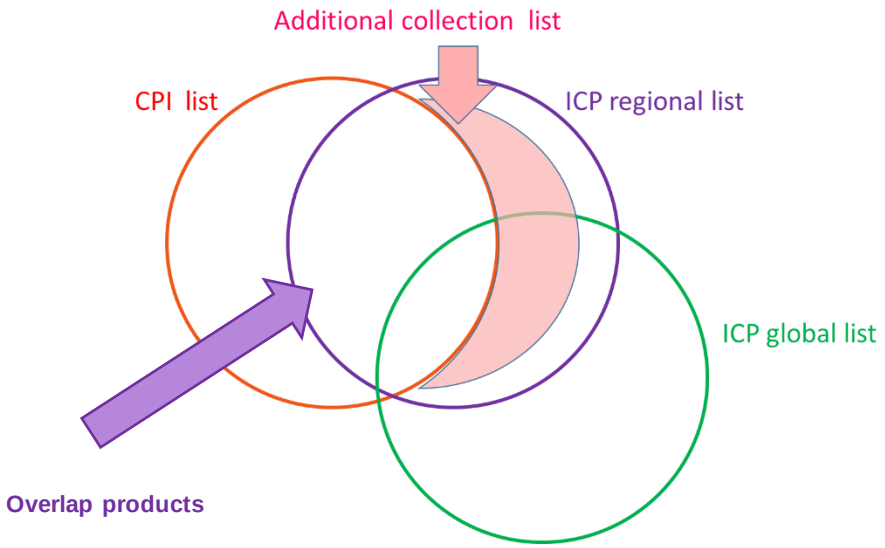
The aim of the regional list is to have as many products as possible priced in the countries affiliated with that region. This provides the basis for spatial price comparisons.

Each regional list incorporates a number of products that are included in the global ICP product list, as well as purely regional products. In the ICP 2017 cycle each regional list incorporated around a quarter of products from the global list, and the choice of products differed between regions.

Typically, a third of a country's national CPI basket is made up of products that are on the regional ICP product list. To fulfill ICP requirements, the country selects additional products to price from the relevant regional ICP list. Together these additional products and those already collected by the CPI make up the national ICP list (figure 4).

[21] The global ICP product list is same as the list of global core list of items, which are priced for the purpose of providing a link or overlap between regional comparisons at the basic-heading level, in order to combine the regional comparisons into a single global comparison. (World Bank, 2020, page 199).

Figure 4: Relationship of national CPI and regional and global ICP product lists



In the case of the CPI basket, the main criteria for inclusion of products or items is representativity, primarily based on the share of household expenditure typically spent on that product or item. Relative volumes sold may also be considered in establishing the representativeness of a product. This list will remain fixed until new expenditure data are available or if selected products disappear. The list of products for the ICP, however, is first established by the regional implementing agency in coordination with national implementing agencies and in conjunction with the ICP Global Office. Countries are expected to price a subset of the ICP list based on their availability as well as their representativity, which is indicated through *importance indicators*.

The national implementing agency should actively participate in the preparation of the ICP product list for the region and include the national CPI product list in the deliberation process. This is only possible when information on the 'specifications' or 'price-determining characteristics' of CPI products is detailed and available for consideration.

This process should be hierarchical, as follows:

- First, the national CPI basket and product list along with SPDs are determined based on country-specific needs and considerations. It is critical to retain the integrity and relevance of the CPI basket while striving to achieve integration of CPI and ICP activities.
- Second, lists of CPI products from different countries are used as inputs into the preparation of regional ICP product lists.
- Finally, regional ICP product lists are used as inputs into the final global ICP product list.

Countries define their baskets at different levels of classification and may use terminology relevant to their context. Thus, some cross referencing to a common standard will be required. The 'item' level is most appropriate (see Table 1). The following is an excerpt from the ICP 2017 global list.

Basic Heading: Bread

Item Code	Item Name
110111301	Baguette, BNR
110111302	Bread loaf, white, BNR
110111303	Bread loaf, whole wheat, BNR
110111304	Bread roll, BNR
110111305	Bread loaf, white, sliced, BRN
110111306	Pita bread, BNR

Note: BNR=brand not relevant.

Practical application:

A simplified process for selecting the regional basket could be:

- Countries submit a list of items included in the CPI basket along with their detailed product characteristics to respective ICP regional implementing agencies;
- ICP regional implementing agencies match products to determine the scope of commonality;
- A cut-off point is identified whereby the regional list comprises products with a certain percentage of country commonality;
- The regional list of items is then compared against previous regional lists and the global list to ensure adequate continuity and coverage; and
- Countries decide which of the regional list items they will include for the additional ICP collection based on considerations of importance and representativity withing each ICP basic heading.

Example

Global items	Country 1	Country 2	Country 3	Country 4	Country 5	Rating	Selected Y/N
Baguette, BNR		x				1	N
Bread loaf, white, BRN	x	x	x	x	x	5	Y
Bread loaf, whole wheat, BNR	x	x		x	x	4	Y
Bread roll, BNR		x			x	2	N
Bread loaf, white, sliced, BNR	x	x	x		x	4	Y
Pita bread, BNR		x				1	N

Note: BNR=brand not relevant.

In this example, five countries identified those varieties included in their national CPI from a list of six products which comprise the global list under the basic heading "Bread". Then, the region decided to include all products that appear in the national CPI basket of at least three countries. This resulted in three products ("Bread loaf, white, BNR"; "Bread loaf, whole wheat, BNR"; and "Bread loaf, white, sliced, BNR") being chosen to form part of the regional basket. Only one of these – "Bread loaf, white, BNR" – appears in the national baskets of all countries. Those countries that do not have these three products in their national baskets may consider them when selecting their additional ICP collection.

Similarly, there may be products that are significant for many countries in a region but do not form part of the global list. This process will help to identify those items that should form part of the regional basket.

It is possible that this process is implemented in two stages. The first takes place at a sub-regional level (in Africa this would be Southern African Development Community (SADC), Common Market for Eastern and Southern Africa (COMESA), Economic Community of West African States (ECOWAS), etc.) and the sub-regional lists are consolidated into a regional list using a similar approach.

The aim is to obtain a balance between ensuring adequate numbers of products to enable the ICP comparison and ensuring that the NSOs can operationally cope with the additional collection.

Once the regional product list has been determined, countries will face three possible scenarios:

1. *Products appear in the regional ICP list which are not in the national CPI basket.* While it may be possible for some countries to introduce ICP products into the collection process at any time, resource permitting, it should be feasible for additional ICP products to be incorporated into CPI data collection activities, for instance, when the CPI basket is being updated. These additional items can be excluded from the actual CPI compilation phase.
2. *There is overlap between the ICP and CPI product lists and the detailed specifications are similar*. This is the ideal situation as there is seamless integration.
3. *There is overlap between the ICP and CPI product lists, but the items are not easily mapped.* For example, where a national CPI has a category "women's shirts" at the elementary index level. Here it will be necessary to ensure that there are an adequate number of varieties in the sample that comply with the ICP specifications. So long as the information for all the characteristics as discussed above are collected, compliant varieties can be identified and extracted from the data after collection.

b) Geographic sample

Key recommendation: CPI and ICP prices should be collected in the same geographic areas, to the extent possible.

Conceptually both the CPI and the ICP should have national coverage. Both aim to be representative of the goods and services purchased by households within the country. In practice, the CPI geographic sample in many countries comprises only urban areas. There are several reasons for this. First, urban areas typically have a higher share of household expenditure and total transactions. Second, residents of rural areas often travel to the nearest urban area to purchase semi-durable and durable goods (e.g. clothing, appliances, mobile telephone, etc.) as well as services. Third, if the price changes in rural and urban areas are the same, the price changes in the urban areas are considered to be representative of the entire country. Finally, when relatively few goods and services are available for pricing in rural areas and outlets are few in number and located great distances apart, the collection of prices in rural areas is not efficient from a resource perspective. Because of the additional financial and logistical costs of data collection in rural areas, in some countries the ICP data collection covers more areas than the CPI, while the converse is true in other countries.

Resources available to NSOs for the collection of prices, and whether relative price changes are the same in rural and urban areas, drive decision regarding the collection of prices in rural areas. When possible, the areas of price collection should be as geographically representative of the whole country as possible.

In larger countries, it may be possible to use spatial adjustment factors (SAFs), similar to those used in the Eurostat region, to convert capital city prices into national average prices. Spatial adjustment factors require the compilation of intra-country spatial price index numbers at frequent intervals.

c) Outlet sample

Key recommendation: The CPI outlet sample should include all outlet types where ICP products are available.

Ideally the CPI outlet sample should include all different types of outlets and should broadly represent those outlets whether households make expenditures. Similarly, the average prices required for PPPs should be based on prices collected from outlets representative of where such items are purchased. Here there is a natural synergy between the CPI and ICP. In those cases where an item in the additional ICP collection is not available in any of the CPI sampled outlets, it may be necessary to augment the CPI sample to include those outlets where the ICP item(s) are available for price collection.

Where a listing of outlets, such as a business register or administrative records, exists then outlets can be sampled according to standard statistical methods. However, in the absence of a formal sampling frame, the choice of outlets is often left to the judgement of CPI staff or the price collector who has some knowledge of the outlets where each product type is predominantly sold or purchased.

d. Sample of product varieties for pricing

Key recommendation: CPI sampling methods should include ICP needs.

The selection of actual product varieties for pricing is perhaps the most important aspect of collecting price data as these observations form the records from which all calculations are made possible.

Typically, sample selection uses non–probability or purposive methods. For the CPI, the goal is to select a variety sample that broadly represents expenditures by households in a given country. One of the most common methods used is to select the most popular varieties. The price collector follows certain rules and procedures to ensure representative varieties are selected and defined. For tight specifications, the variety is selected and defined by CPI staff, sometimes in consultation with data collectors. The detailed specifications are then sent to all data collectors for the collection of prices.

ICP sampling requirements are designed to compute average prices and therefore comparability is required before representativity. To this end, clear requirements on the type of brand and size apply. This will cause some difficulty in aligning CPI and ICP price collection. Representativity information in the ICP is conveyed through *importance indicators*. Countries report whether an item is important relative to the other items within a particular basic heading (not across all basic headings). Countries should take this process seriously and provide this information for ICP purposes. Importance may be determined by the presence of the product (or one similar) in the CPI basket (overlap) or by what price collectors perceive as the best-selling brands.

For those ICP products that do not form part of the CPI basket and are included in the additional price collection, the number and specifications of the priced products will follow the requirements set down by the ICP as far as possible.

For overlap products, there are two possible scenarios:

1. ICP product specifications are compatible with the most representative products included in the CPI sample.
2. ICP needs require the identification of a variety not considered representative for CPI needs.

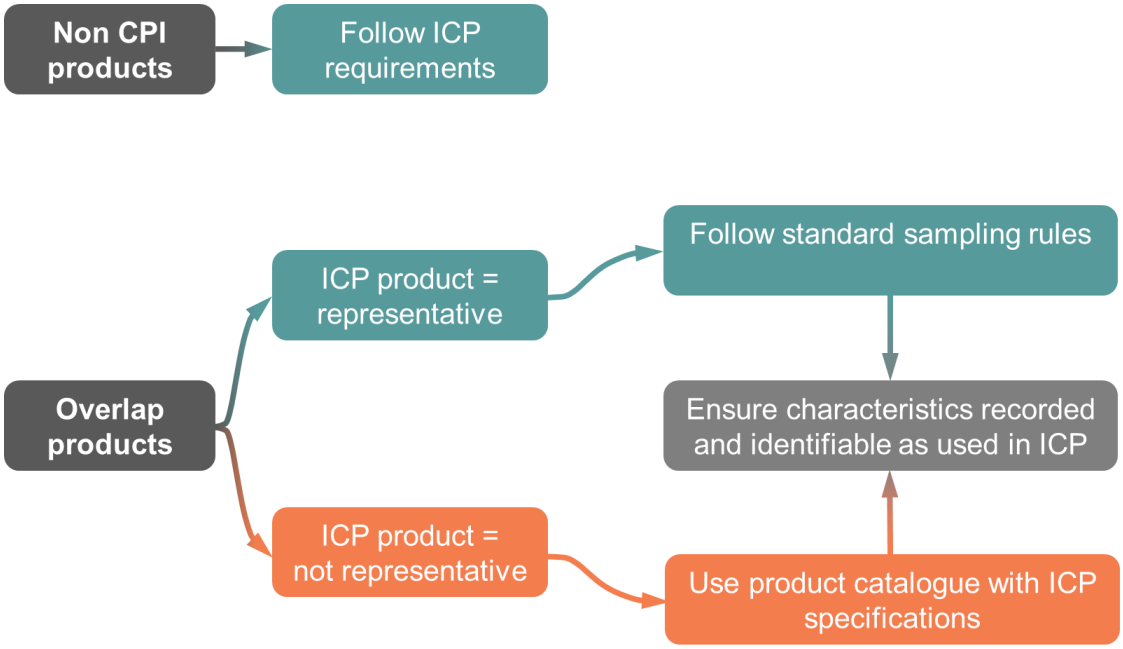
Figure 5 illustrates these scenarios and decisions in a flow diagram.

In the first case, all that is required is that those CPI products that conform to ICP requirements and needs are identifiable and that all the relevant characteristics are recorded. Section 6.1.2 discusses the variables that should be included on the questionnaire and data processing system to ensure that these products can be easily extracted and incorporated into the calculation of average prices for PPPs. Identification of the variety could be through a parallel coding system, or a simple tick box.

In the second case, the price collector should be provided with a list that details the specifications for each product. Such lists could form part of the product catalogue discussed later in section 6.2.2. The prices of these products could be used in calculating the CPI as long as other, more

representative varieties are priced and the number of less representative varieties included represents a small proportion of the total number of collected prices for that item.

Figure 5. Scenarios for sampling ICP product varieties



As part of the ongoing sample maintenance processes for CPIs, NSO head office coordinators will need to review the number of prices collected for the ICP each month to ensure that the sampling requirements are met. Under- and over-collection should be recorded in order to provide remedial instructions to collection staff in the following month.

6.2 Price collection

Price collection is where integration is effectively achieved at an operational level. This is especially the case where ICP price collection has been funded and operated separately from the CPI. As the ICP becomes a more regular annual activity, additional external funding is likely to become scarcer.

There is significant diversity in the way that countries arrange their CPI price collection operations including the relationship between statisticians and the field workers. In most cases, ICP data collection will form part of the CPI operations and there will be no need to make major changes. Integrating the ICP should prompt a broad review of CPI data collection methods to identify areas for improvement.

There are two main areas in which ICP and CPI integration can be promoted in the data collection phase. The first is in the daily operational processes managed through a schedule and work allocation. The second is in the training and support provided to data collectors.

6.2.1 Schedule and work allocation

Key recommendation: All price data should be collected according to the same schedule.

- All price collectors should be involved in collecting all prices irrespective of whether they are used for the CPI only, both the CPI and the ICP, or for the ICP only.
- To maximize efficiencies, the collection schedule should be designed so that additional ICP products are collected as part of the normal collection timetable and mostly in the same outlets as all other CPI products. This will avoid ICP products being left to the end of the month and possibly not being collected if there are time overruns. It should also reduce travelling and time costs for the NSO as price collectors will not need to return to an outlet or area to collect ICP data.

6.2.2 Support materials and training

Key recommendation: All field staff should be trained on product specifications, variables, and changes to data collection forms.

Having highly trained data collectors reduces the incidence of error and other issues that can affect quality. It considered a best practice to provide data collectors with refresher training each year.

There are two important elements of training to consider:

- First, fieldworkers must understand the new specifications to be recorded and the ways that they are to do this. They must also know how to complete any fields in the price collection form that have been changed to accommodate ICP needs.
- Second, they must have adequate knowledge of the overlap and additional ICP products that should be collected. This knowledge includes the restrictions on each product such as brand or size.

A product catalogue is a useful tool for price collectors. This is a visual aid containing a photographic example of the type of item and a description by way of completed variables that appear on the price collection form. The product restrictions required for ICP can also be included in the product catalogue.

6.3 Processing and editing

6.3.1 Capture data

Key recommendation: Data required for the ICP should be stored in the same database as the CPI and other price data.

All prices should be captured and stored in single database. In cases where CPI data are collected using mobile devices, data collection and initial editing are combined.

This means that adaptations will need to be made to the CPI system to allow collection of the additional specifications as discussed above. Because of the precision required in defining products for the ICP and ensuring that identical products are compared for the calculation of average prices, the fields should be populated by predetermined drop down lists. This eliminates any variation in spelling or punctuation that can impede the speed and efficiency of the editing processes.

6.3.2 Validate and edit data

The aim of editing is to ensure that the data are fit for purpose for the next phase of the process. All CPI programs should have quality assurance processes in place to detect errors made in price collection and data entry. Applying additional requirements and procedures used for the ICP may enhance the validation methods used the CPI.

The first check should be to ensure that varieties selected for pricing conform to the restrictions imposed by the ICP. This should initially be done by field supervisors; and then again by statisticians responsible for editing and quality assuring the data. This phase is most essential when an item is being selected or priced for the first time. This check should also confirm that the characteristics have been correctly recorded.

The initial editing phases of the data should include checking the detailed specifications as well as the prices. This editing would identify any errors or omissions from either data collection or data entry. Where possible, corrections should be made to the data – so long as these are not making unsubstantiated assumptions about the missing information. For example, editing could easily fix a spelling error or a unit of measure but perhaps not the actual weight or quantity. Entries that cannot be corrected appropriately should be excluded from further processes. A log of all changes should be maintained for later analysis. This can point to areas in which staff may require further training.

Calculation of average prices, which is fundamental to PPP compilation, may also be useful for CPI editing. Identifying outliers among prices constituting an average can highlight products that do not comply with specifications or are of different quality than other purchases.

The final processing phase will only apply to those price observations that are to be used in the ICP calculations. The ICP editing system ensures compliance to strict definitions and standardization in an iterative fashion.

Following the recommendations above will substantially reduce the time needed for this final editing process. It should also limit the need for regional meetings to conduct editing activities – further reducing funding requirements.

7. Scanner data and web-scraped prices

Increasingly national CPIs are using alternative sources of data to enhance traditional price collection. These include (i) scanner data, which provide a particular type of transaction data that uses the barcode, that is, the Global Trade Item Number (GTIN), for presenting aggregated information on the sales of products, and (ii) web-scraped data, which reflect the offer or asking-price for a product or service.

Scanner data on transactions sourced from retailers hold significant promise for CPIs as the granularity of the data provides more information than the recording of a price once a month. Furthermore, the marginal cost of obtaining additional prices is negligible or zero in many countries, which will significantly help to reduce the resource requirements of data collection. However, it should be noted that scanner data must be purchased in some countries and it can be very costly.

Scanner data not only supplies the price paid for a product, but also the quantity purchased in each transaction. Scanner data typically include a description of each variety together with the barcode. If the description includes all the variables required for ICP purposes, these data should be used. If the description is not packaged into discrete variables then some programming will be required to separate and extract the brand and size, etc. This allows the calculation of price indices with real time weights using a superlative index formula. The availability of scanner data has implications for the aggregation procedure used at the elementary or basic-heading level. The ICP currently uses the country-product-dummy (CPD) method without any actual weights, aside from the weights based on importance indicators. The availability of quantity data with price observations makes it possible to introduce quantity or expenditure-based weights at the basic-heading level. Consequently, use of scanner data could eliminate the need to use importance indicators for products as proper quantity and expenditure-based weights are available at the product level. In addition, weights from scanner data could inform the development of item lists.

Web scraping is a technique used to harvest data from online sources, such as the websites of traditional outlets, web-based outlets, and online marketplaces or platforms. Because representativity of the varieties are not available on the website, web scraping is a supplement to, rather than a replacement for, manual price collection. Web-scraped data should be suitable for use in the ICP as the characteristics of the variety can be recorded in discrete fields by the program. However, representativity of web-scraped prices should still be assessed for ICP uses.

8. Housing and dwelling services

Treatment of housing is an important element in the compilation of CPIs as well as in the compilation of PPPs within the ICP, given associated consumption weights. Part D of Chapter 11 of the CPI Manual discusses the treatment of housing in CPIs. Chapter 12 of "*Measuring the Real Size of the World Economy: The Framework, Methodology, and Results of the International Comparison Program (ICP)*",[22] discusses the problems with compiling PPPs for housing. The problems encountered in the context of CPI and ICP are similar and, therefore there are significant benefits for countries to integrate and develop a unified approach to making temporal and cross-country comparisons of housing costs.

The main problem arises in measuring costs for owner-occupied housing. The CPI Manual discusses various options including: (i) acquisitions approach; (ii) the payments approach; and (iii) the user cost approaches. In the case of CPIs, a measure of price change for dwellings would be based on rents for a sample of properties, an appropriately designed stratified sample, along with weights reflecting the importance of each stratum.

The methodology recommended for the compilation of PPPs for housing within the ICP is similar to the rental equivalence approach. The recently released report on 2017 ICP by the World Bank, "Purchasing Power Parities and the Size of World Economies: Results from the 2017 International Comparison Program"[23] (World Bank, 2020, page 80) explains the approach currently recommended as: "…Under the rental approach, rental prices are collected for similar dwelling types in each economy. This method has been found to work well in economies in which the dwellings actually rented are representative of the stock of dwellings as a whole and where statistical agencies collect information on rents paid for the different kinds of dwellings that are rented in most parts of the economy."

9. Conclusion and next steps

Harmonization and integration of CPI and ICP related activities have long been recognized as critical to the sustainability of ICP activities. At the recommendation of the Friends of the Chair of the United Nations Statistical Commission, the ICP Global Office has identified this as a priority topic for the ICP Research Agenda. Results presented in Section 5 illustrate that countries involved in the compilation of PPPs as a part of the ICP have already recognized the importance of CPI-ICP integration and have been implementing strategies to promote such integration at varying levels.

An attempt is made in this guide to identify key areas for CPI-ICP integration and to articulate a set of recommendations designed to promote integration and to realize the potential synergies arising

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[22] https://www.worldbank.org/en/programs/icp/brief/2011-icp-book

[23] https://openknowledge.worldbank.org/bitstream/handle/10986/33623/9781464815300.pdf

out of CPI-ICP integration. The guide employs an approach based on the statistical value chain with particular focus on the design, price collection and, ultimately, on the processing and validation of data used in PPP compilation. In addition, several case studies on CPI-ICP integration are appended to this guide.

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Appendix A: CPI-ICP integration questionnaire

1. Respondent details

Country	
Name of institution	
Person completing questionnaire	Name:
	Position held and Department:
	E-mail:

Is the collection of prices for ICP carried out by the same organisational unit as price collection for CPI?	Yes	No

2. Price collection

Please indicate the approximate number of locations and outlets and price observations that are collected, on average, each month/quarter.

	Number of Locations	**Number of Outlets**	**Frequency of price collection (monthly or quarterly?)**	**Number of price observations**
CPI				
ICP				

Number of products in CPI and ICP basket

Total number of products in CPI basket	**Number of ICP products in CPI basket (overlap)**	**Number of ICP products not in CPI basket (extra collection)**

Price collection

Do you use the same form/questionnaire/hand-held device for CPI and ICP price collection?	Yes	No

Number of price collection staff (full time equivalent) for CPI	

Number of price collection staff (full time equivalent) for ICP	

Are the price collection staff for ICP a subset of the CPI price collection staff?	Yes	No	Other: Some are and some not

Do staff working on ICP receive training on the ICP requirements?	Yes	No

Is there a product catalogue/photobank to assist field workers with ICP collection?	Yes	No

Is price collection for ICP carried out at the same time as the CPI price collection?	Yes	No	Only on overlap products

Does your NSO receive additional funding to carry out the ICP collection?	Yes	No

Do staff members of the NSO receive an additional allowance to carry out the ICP collection?	Yes	No

Please indicate the geographic coverage of your country's ICP household consumption survey.

Please select the statement that most closely applies.

Coverage is national (includes urban and rural areas, as per the national definition of "urban" and "rural")	
Coverage is urban only (includes the capital city, plus other main cities and metropolitan areas, but excludes surrounding rural areas)	

Coverage is capital city only (includes only the capital city – note: can include surrounding urban areas)	
Other geographical coverage (*please specify*)	

Please indicate whether spatial adjustment factors (SAFs), used to convert urban average prices and/ or capital city average prices to national average prices, were produced for your country's ICP household consumption survey.

Please check all that apply.

SAFs were produced for individual products	
SAFs were produced for <u>lower</u> level aggregations such as ICP basic headings	
SAFs were produced for <u>higher</u> level aggregations such as ICP classes, groups, or categories	
Other, please explain	
Not applicable	

3. <u>Data processing</u>

Is ICP data captured in the same computer system as the CPI data?	Yes	No	Only on overlap products

Do you use the same editing/control procedures to ensure quality on CPI and ICP data	Yes	No	Only on overlap products

Do ICP validation procedures help improve your processing of CPI data?	Not useful	Somewhat useful	Very useful

4. General

Do you as an organisation have plans in place to implement changes that will improve the integration of CPI and ICP price collection and processes in the near future	Yes	No

Do you have suggestions on how to improve the integration of CPI and ICP price collection and processing?

Appendix B: Case studies

CASE STUDIES FROM INDIA, ISRAEL, UNITED KINGDOM and SOUTH AFRICA

CPI/ICP case study: India

Introduction

India has participated in all ICP rounds, except for 1993. Most of the participating economies, including India, especially in the Asia and the Pacific Region, have been conducting fresh surveys in a number of selected markets for collecting prices of a basket of goods and services in the reference years of respective ICP rounds. Conducting separate surveys requires deployment of additional manpower and financial resources, which results in delay in respect of many countries and the quality of national average prices for the reference period is consequently affected.

In the present situation, when the ICP has become a permanent element of global statistical programme, it has indeed become necessary to integrate ICP with CPI. Most of the countries produce CPI (monthly or quarterly) for which they collect prices of household consumable items. In ICP also, household items, put together, have share of more than 80% (in terms of number of items/products, not the GDP expenditure). Therefore, aforementioned synergy can reduce significant burden of survey for ICP and energy of the National Statistics Office would more be devoted towards validation of national average prices.

1. Dimensions of ICP-CPI synergy

There are two dimensions of ICP-CPI integration: (a) integration of sample design for selection of markets and outlets, and deployment of same manpower for conducting both the surveys of ICP and CPI; and (b) integration of baskets of household consumable goods and services. First dimension ensures good coverage of markets, at reduced cost, for estimating robust national average prices whereas second dimension emphasizes on regular flow of quality data and provides detailed information on important and less important items of the ICP basket.

1.1 Integration of sample design

Integration of sample design is easy to implement by any country. The entire set of markets of CPI or a subset thereof may be taken and the same manpower may be deployed for price collection of ICP. If these markets do not represent the country as a whole then average of the prices are poor estimates of national average prices of ICP basket.

In the case of India, CPI is compiled using prices from 2,295 markets (1,181 rural covering almost all districts and 1,114 urban markets of 310 towns) of the country. There is an adequate representation of each part of the country. Therefore, a subset of the markets (taking representation from each region) is sufficient to give good estimates of national average prices.

1.2 Integration of baskets

Implementation of second dimension has really a major challenge of weak commonality between

Structured Product Descriptions (SPDs) of ICP and those of CPI baskets. ICP prioritizes comparability over representativity whereas CPI hinges on representativeness. Enhancing comparability compromises on representativeness, which affect the quality of CPI and vice versa. Therefore, a model is required to be developed for integrating both the baskets without affecting the quality of these indicators.

2. Methodology proposed to be adopted for integration in India

2.1 Integration of sample design and manpower deployment

India used this dimension of convergence in earlier rounds of ICP, especially in 2011 and 2017 by taking a subset of the CPI markets. For ICP 2017, Prices were collected from 577 urban and 320 rural markets.

For ICP, subsets of aforementioned rural and urban markets (all markets of those large NSS Regions which have 12 or more markets in each rural and urban sector, ensuring at least one NSS Region in each State for giving nation-wide representation) would be taken in the rural and urban samples of markets for conducting the price survey of household items. A total of 947 rural and 946 urban markets are being covered for price survey for ICP.

The outlets identified for CPI are to be used for collection of prices for ICP items in the aforementioned rural and urban markets. It is important to mention here that shops selected for CPI items are the most popular outlets; therefore, there is a fair chance that products of different specifications of ICP are available in these shops.

2.2 Integration of ICP and CPI baskets

As mentioned before, the major challenge in establishing synergy in both the baskets is poor commonality. India is a vast country having varied consumption patterns, and preferences of goods and services within short distances. Therefore, a large sample size is required for compilation of CPI to capture all types of consumption behavior. SPDs of CPI items are fixed market wise so that the prices of most representative products are collected during the survey. As a result, SPDs of items differ from market to market. Even if some of the SPDs of CPI basket is identical to those of ICP basket, this would not hold true for all the markets of all different States. Therefore, those CPI prices may not be used to compute national average prices.

While examining the product catalogue of Asia and the Pacific, it has been found that the SPDs of fruits and vegetables may be considered common to those of CPI in a fairly large number of markets. But in case of non-ICP items of ICP, conducting a parallel survey is required.

There are about 930 household items/products in ICP. Out of these, about 40 items fall in the category of fruits and vegetables. Even after excluding these items, there are about 890 items to be added to the list of CPI items, if their prices are to be collected along with the products contained in the CPI basket. Conducting a survey for such a long list is practically not feasible.

In view of this, it is proposed that prices of fruits and vegetables collected in each market for

CPI would be used for ICP baskets also; and for the remaining household items, ICP basket would be divided into 12 parts. One part would be allotted to one market of that NSS Region of the respective sector. Here, it is important to reiterate that these are large NSS Regions having 12 or more markets in each sector. Thus, there would be addition of only 890/12 = 74 items to the CPI basket of a particular market of the respective NSS Region. If number of markets in a NSS Region is more than 12 then the items falling in the category of Food, Clothing and Footwear (about 415 to 420 items) would be distributed in the remaining markets (other than the aforementioned 12) of the respective sector. For instance, there are 23 markets in the rural sector of an NSS Region of Chhatishgarh. In this case, 12 different sets of 74 items would be added to CPI baskets of 12 markets. Then in the remaining 11 markets, 11 different sets of 38 items (420/11 = 38) of Food, Clothing and Footwear would be added to the CPI baskets. These ICP items would be clearly classified as ICP items in the schedule of price collection and data entry software in order to avoid confusion.

There is another option of splitting the ICP basket over time; for instance, one-third of the basket is surveyed in the first, second and third months of a quarter. Durable items (other than Food, Clothing and Footwear) may be even surveyed every six months. A similar approach was followed by India in ICP 2011 and 2017. But the strategy mentioned above has been found more appropriate because of following reasons:

- the proposed method adds only 75 items to the CPI basket of a particular market whereas another approach includes a greater number of items; and
- prices are collected every month, which captures month to month fluctuations in prices without compromising the coverage of space.

Adoption of this approach neither affects the representativeness of CPI baskets nor compromises on spatial comparability of ICP items.

Increasing the size of basket leads to reluctance on the part of a shopkeeper, which results in non-response and not reporting the actual transaction prices. Therefore, it is necessary that the basket should of optimum size. In order to compensate the additional load of about 75 ICP items on CPI basket, a methodology has been worked out to reduce the size of CPI basket.

The experience of the existing series of CPI says that names of the item containing word 'other' under each sub-group poses problem in price collection since the SPD is not well defined. Therefore, such items would be removed from the CPI Basket of the revised series, their weights, is any, be pro rata distributed on the remaining items of the respective sub-groups.

This strategy is expected to reduce about 70 to 80 items in the baskets of CPI of a particular market, which gives sufficient scope to add 75 ICP items to CPI basket without giving additional load on the data collectors.

The collected ICP prices would pass through scrutiny checks every month along with CPI data and validated data be stored for computation of national average prices as and when required

by the Asian Development Bank (ADB), the Regional Implementing Agency for ICP Asia and the Pacific.

2.3 Methodology for preparation of different sets of 75 ICP items

While preparing sets of 75 ICP items/products, it would be ensured that all categories of COICOP are proportionately represented in each set and all items of a particular basic heading would be surveyed together in the same market. Further, deviations of SPDs of CPI items from that of ICP items would be examined market wise. If there is difference in terms of variety, brand, quality, model etc. then items of both the baskets would be considered not-common, on the other hand if deviation occurs due to difference in unit and quantity, then items of both the baskets may be considered as approximately common. If such commonality is found, in respect of a particular product, in majority of the markets, then that item would be classified as important item. This analysis would help in providing information on 'Important' and 'Less important' ICP items for assigning suitable weights by the PPP compiling agency.

CPI/ICP case study: Israel

1. Introduction

The Central Bureau of Statistics in Israel (ICBS) participates in the International Comparison Project (ICP) on a regular basis since 1996.

The global offices in charge of conducting the ICP are introducing new and improved features to the program on a continuous basis. These included in the 2005 round:

- A new Structured Product Description (SPD) approach that has improved the scope and quality of regional and global lists of specifications.
- A comprehensive Handbook and a set of operational guidelines that serve both as reference material and step-by-step guidance for data collection and compilation.
- An integrated software system, the Tool Pack, that has been developed for standardized data collection, verification and processing, and capacity building.
- Improvements in construction and equipment surveys, aggregation of PPPs at the basic-heading level, linking of regional results to estimate robust global PPPs, and estimation of poverty-specific PPPs.

The participating countries like Israel have benefited from some of these changes. However, we remain responsible for the tedious task of price collection, a task performed without receiving special resources as the PPP does not carry the same "clout" as the national CPI. Therefore, we seek for synergies in the process and search ways to utilize the resources already allocated for the routine CPI program in order to keep up to PPP standards.

2. Issues in price collection for PPP

Price collection is the responsibility of the participating countries. Before they can begin price collection, they have to complete a number of tasks. These involve: selecting and contacting the outlets to be visited by price collectors; preparing the pricing materials and supplementary documentation for price collectors (including, if necessary, the translation of survey guidelines and product specifications into the national language); identifying which specifications on the final group product list are to be priced and, in the case of generic specifications, which brands are to be priced; and holding a meeting with price collectors to clarify issues such as how many items per basic heading, how many price observations per item, etc.

The selection of outlets is of particular importance because of the effect it will have on the average prices of the products to be surveyed. Different products have different distribution profiles. Some products are sold mostly in supermarkets; other products are sold mainly in specialist shops. Prices for the same product can vary from outlet type to outlet type because it is being sold under varying conditions.

A common starting point for the selection of outlets is the sample of outlets used for the CPI,

but it is only a starting point. The product lists for Eurostat and OECD price surveys are larger than CPI lists, specifying products not included in the CPI. The CPI sample may not be ideal to collect reliable prices for these products because the selection of outlets by type is not in proportion to the volume of their sales of the products. In this case, it is necessary to augment the CPI sample with additional outlets. At the same time, because the resources available for the price surveys are limited, the CPI sample may be too large and has to be reduced.

3. The present work process

The Division of Consumer Prices at ICBS assumed responsibility for PPP as of January 2004. In practice we collect prices for the 3,000 goods and services defined in the program that serve as the basis for computing the PPPs and international comparability.

Price collection is conducted via paper questionnaires that are sent to us by OECD. The overall work process that was established at initiation was as follows:

- The dataset is received from OECD and sent to the price coordinator for "deciphering".
- A weekly timetable for price collection is defined.
- Price data are collected: price (standardized to definition), date of collection; also punched into a different dataset are the details of the outlet and specification of any problems encountered in the collection process.
- An editing and logical check process is applied. Data may be supplemented from the Internet or CPI data. The PPP coordinator sends the edited data to OECD.
- The Data are sent back from OECD to the PPP coordinator for questions, clarifications, etc.
- Additional checks are conducted in the field, when deemed necessary.

This complex process has led to several problems that were defined in order to look for ways to improve the collection and editing stages of the PPP. These problems include:

- Refusal to cooperate – in contrast to the CPI where there is a legal obligation to participate, the PPP program required "lobbying" on our part in order to ensure participation. This may lead to non-response errors that arise from the failure to obtain required information in a full and timely manner from all the units selected in the sample. If the prices of the nonresponding outlets differ from those of the responding outlets, the results of the price survey will be biased.
- Definition discrepancies – between goods that are defined in the questionnaire that may be irrelevant or non-existent in the local market. The problem is acute in electronic appliances, clothing and footwear.
- Judgmental sampling – as there is no one single sampling frame for a CPI, non-probability sampling or "second degree judging" in a PPP program is conducted at times by the price collector.

- Although empirical results of research undertaken by Statistics Netherlands for CPI nevertheless show that non-probability selection methods do not necessarily perform worse, in terms of the mean square error, than probability sampling techniques – one would assume that this is due to the sound methodology of CPI compilation at all stages.
- Sales – the handling of sales prices in our PPP may be dubious due to the sporadic nature of the price collection.
- Seasonality – the problems of seasonality are magnified in a PPP price collection that is not spread throughout the calendar year for all questionnaires.
- Using price indices for adjustment of PPP prices over time – this process assumes a good match between the selected CPI and the good or service from the PPP. At times this may be a strong assumption.
- "Made in China" – the local market is flooded with electronic appliances that are dominant in household purchases and are of different technology and prices than those that are defined in the questionnaire.
- Many prices that are needed for PPP (down to the exact SPD) were already being collected in the CPI program. Furthermore, at times, prices for PPP were collected in stores that were located "next door" to the CPI outlets.
- The price indices computed for adjustment of prices to specific time periods for OECD were done by hand and in non-economical fashion.

4. Enhancing the Synergies between CPI and PPP

Many of the problems described in the former section stemmed from the "disconnect" between the two programs. Realizing that the CPI program can be utilized in many ways in favor of PPP we initiated a program in the 2005 round that enhances the synergies between the programs in three areas: (i) price collection, (ii) price methodology and (iii) CPI technology principles.

4.1 Price Collection

Many of the goods and services that are collected in the CPI framework are also required for PPP (especially household expenditure). The following procedures were introduced:

- Using the prices of the following services for PPP: electricity, gas, water, public transportation, health insurance, car insurance, recreation and several other personal services are taken directly from the CPI without requiring additional resources.
- The prices of goods in the CPI can be used for supplemental information and logical checks.
- Fresh fruit and vegetables: average annual prices are computed based on the monthly CPI collection. This alleviates the problem of seasonality mentioned above.
- The selection process of items in the CPI is based on the most popular item as

determined by the proprietor. This is also the item required in many cases for the PPP. We now combine between the two.

- Increasing the sample size of PPP based on the CPI outlets. In cases where the PPP sample is not large enough, we can use CPI data to compute an average price with the PPP data.
- Refusals have been brought to the minimum due the fact that collecting the CPI data for purposes of PPP has elevated the legal binding of this data under the statistical ordinance. In addition, the PPP price collector has gained experience and established cordial relations with the shopkeepers.

4.2 Combining price methodology of CPI and PPP in the fieldwork:

- Sampling procedures for CPI have been expanded to allow for inclusion of PPP.
- Use of administrative data for CPI (like housing, health records, etc.) in PPP.
- CPI methodology requires selection of the popular items. PPP methodology requires a mix of representativity in local markets and international comparability – two forces that are contradictory at time. We now try to apply this method in CPI in order to be able to serve both programs.
- Collect regular and sales prices for PPP and send this data to the OECD (when required) for their decision.
- Editing and logical checks are performed in the CPI unit under the supervision of the Head of Division and using the same methodology as in CPI.

4.3 Similar technological principles for PPP:

A system, which automatically classifies PPP and CPI into identical categories, was developed. This enables current updates of the indices needed for the PPP by OECD. The CPI basket is updated every two years and the computer system accordingly. The system was developed in three stages:

- The consumption items that were identical for both programs were selected.
- Special aggregates were built for the requirements of PPP.
- The datasets were classified according to the same international classification.

An initiation document for developing a total PPP system within the framework of CPI is now in process.

CPI/ICP case study: United Kingdom[24]

1. Introduction and historical background

The role of the UK as it currently stands is that as part of the European Union. There is uncertainty over the future role and membership of the UK in the EU due to BREXIT. The UK is currently (primarily) funded by Eurostat to deliver the outputs of the European Comparison Programme[25] (ECP). However, there is a risk that if the UK leaves with a *'no deal exit'* funding will be withdrawn. It is therefore imperative that, going forward, the UK utilizes its current resources, including price data to its full effect. This includes using CPI data where possible, both for use in PPP calculations as well as for quality assurances purposes and taking advantage of the challenging and significant work that ONS is currently undertaking regarding using Alternative Data Sources (ADS).

The main area of integration in the shorter term will be the use of Alternative Data Sources such as web scraped and scanner data for both CPI and PPP outputs and not one necessarily of using the same systems and processes to calculate the different outputs. This is because currently the systems and processes which underpin the PPP calculations are developed and supported by Eurostat, whilst the CPI is imbedded in systems and processes developed and supported internally, in ONS; therefore, minimum synergy exists.

2. Main objectives and motivation

The ECP basket has more than 2,500 items where the national UK CPI has approximately 750 items. The UK CPI basket comprises representative goods of the UK domestic market whereas the ECP/ICP basket comprise of both non representative and representative items which are important in all markets of the Programme (both ECP and ICP). Countries are expected to collect for both non representative and representative items due to the way the indexes are calculated. This fundamental difference in the baskets is the main barrier to the integration of these two outputs.

The main objective or motivation of integrating CPI and ECP/ICP must be resources, both cost and efficiency. The aim is that each price collected could be used in several outputs. Currently in the UK, prices are collected separately for the UK CPI and the ECP/ICP. There are a few exceptions; petrol and energy prices.

Outside the calculation of the Spatial Adjustment Factors (SAFs), (where more than 250,000 CPI prices were used for PPP purposes) there is very limited sharing or integration of data that is used, by either party. With the exception of petrol and energy and for validation purposes (i.e. ensuring that the PPP movements align to the movement in the CPI), PPPs do not use CPI data and vice versa. However, the use of CPI data for the ECP SAF project demonstrates that CPI data is suitable for PPP

[24] This note has been written before the withdrawal of the United Kingdom from the European Union and the European Atomic Energy Community in January 31, 2020.

[25] The ECP is part of the Eurostat-OECD PPP comparison.

purposes, albeit not across all products. However, with increasing demand on resources and an appetite to *'collect one price that could be used for all'*, the need to collect one price and use for constraints on resources, there is an increased need to utilized price data that is being collected.

3. Initiatives for CPI-ICP integration

3.1. Alternative Data Sources

Alternative Data Sources (ADS) have been growing in importance over the last few years within ONS as a means of collecting price data as an alternative to the more traditional methods of collecting such as out in the 'field', by telephone or via the internet.

a) Scanner data

Scanner data are data collected by retailers at the point of sale. It will provide us with information on what products are sold, how many were sold and at what price, giving ONS significantly more information about prices, but also what expenditure weight each item should have within our virtual shopping basket. Currently for PPPs the lowest level at which expenditure weights are available are at basic-heading level. ONS is currently engaging with key retailers in the UK obtaining scanner data on items ranging from food through to alcoholic beverages and personal items.

b) Web scraped data

Web scraped price data are collected from shops' websites and can provide a wealth of additional product information about online prices, such as product descriptions, directly from retailers' websites. For example, as well as obtaining the price of a laptop, ONS will collect information such as the laptop's RAM and processor speed, which help us ensure the products we are comparing are the same quality over time.

In the ECP consumer survey of House and Garden, the UK PPP team, for the first time embraced the new technology and used web scraped data for 15 electrical items. Python was used to run the coding and scrape the website overnight (as this had been agreed in advance with the retailer). This was repeated several times during the four week collection period which allowed for not only a spatial comparison with other countries but also temporal comparison for the UK.

3.2. Areas where integration is achieved

From a UK perspective, and due to the national importance of the CPI, it is highly unlikely that ECP data will be used for CPI but rather, CPI prices will be used for ECP/ICP purposes. This is primarily caused by the detailed specifications required in the ECP collection in comparison to broader CPI items specifications.

The example below shows the difference between the ECP and the CPI specification and the level of detail required for the ECP collection. For example, in the UK CPI a women's shoe item allows a collector to price for any high heel shoe regardless of brand or material composition if it's the same or comparable to the previous month's CPI item. For PPP purposes, the shoe will have a more detailed specification, including details such as brand level, material composition and the heel

height. Due to these differences in the specifications, it is not possible to use the average prices taken from the CPI collection, as it is unknown if observations would meet the PPP specification requirements.

Table 1: Item specifications for ladies' shoes

ECP item specification	**CPI item specification**
Ladies conventional court shoes, WKB-H Well Known brand – High Type - Court shoe Without decoration Upper Material – Leather Sole Material – leather or synthetic Heel height – approx. 7cm Specify brand and sole	Women's shoes, high heels over 1.5"/4cm Material – can be man-made, leather, speciality fabric, upper and soles Fastening can be slip on, buckle, button, lace

Therefore, for the regular ECP/ICP consumer surveys that the UK undertakes, very little CPI data is used, rather it is used for quality assurance purposes.

That said, however, the UK was successful in using CPI prices for use in the PPP calculations when it undertook a nationwide regional price survey to calculate correction coefficients (Spatial Adjustment Factors (SAFs)). These SAFs are used to adjust the capital average prices (in the case of the UK, London prices) of those observations collected as part of the ECP consumer goods and services surveys. Due to resource constrains, prices for the ECP are only observed in the capital of each of the member states. However, the requirement is to calculate national average prices and not capital prices and therefore every six years a project is undertake whereby prices are collected from regions within the UK. The resultant correction coefficient is then applied to the capital average prices, at basic-heading level, along with Temporal Adjustment Factors (TAFs) to arrive at average national prices.

3.3. Sectors where CPI data are appropriate to use for ECP/ICP

As part of the SAF project it was necessary to use CPI data wherever possible, to reduce costs and improve efficiency. Potentially, there are more than 2,500 items in the ECP basket of consumer goods and services, and analysis was conducted as to how many of the 750 CPI items could potentially be used to represent these 2,500 items. Many items had synergies between the two thus allowing integration of CPI and ECP. Where there was synergy in the item specifications, this ensured that resources in the field could be utilized effectively and could be used on those items where either CPI data did not exist or where the specifications were difficult or narrow and CPI data could not be used.

Additionally, a concerted effort to understand where national pricing exists ensured that a targeted data collection process could take place. Approximately 277,500 prices were utilized from the UK

CPI dataset.

Food items in general tend to have more synergy and therefore integration is easier to obtain, hence the high number of CPI items (>50%) used for ECP purposes for the aggregate of Food, Beverages. Alcohol and Tobacco. Refer to item below, 'fresh watermelon', where the CPI data can be used for ECP/ICP purposes as the specification is virtually identical.

Table 2: Item specifications for fresh watermelon

ECP item specification	**CPI item specification**
1 Kilogram Fresh watermelon Sold loose Medium Good quality; intact (unbroken, unmarked) skin Exclude: Fair trade fruits, organic fruits State: Whether "in-season" or "out-of-season" Ref quantity:1kilogram	Fresh watermelon. 1KG

However, this is not the case for many of the items in the ECP/ICP Furniture and Health survey due to the very detailed and tight ECP/ICP specification of furniture items. Comparability across furniture items is difficult to achieve and is always a challenge. Therefore, the ECP/ICP specification must be very detailed and 'closed' to achieve harmonization across all participating countries in both Programmes. For CPI, however, the key is to collect the same item month on month regardless if the item is WKB-L or WKB-H or indeed brandless. Therefore, no CPI prices could be used for this aggregate. For reasons of comparability across the ECP/ICP items, it would not be possible to have a less descriptive item for furniture; the ethos of both the ECP and the ICP is comparability and taking such an action would put this at risk. The only alternative is to make the CPI item more descriptive. However, with resources being a challenge for many NSIs and with the CPI taking priority this will be an impossible task using the current method of collection, either out in the field, via the internet or telephoning. However, this could be achieved via the use of alternative data sources such as web scraped and scanner data.

Refer to furniture item below which demonstrates the reasons why many CPI items cannot be used for ECP/ICP purposes

Table 3: Item specifications for spring mattress

ECP item specification	**CPI item specification**
<u>Spring mattress, single spring system, without comfort zones</u>	Mattress, 3ft/90cm, interior sprung

Brandless 1 Piece Spring system, single, without comfort zones Cover: cotton or mixed material, Padding: foam plastic, liner: felt (comfort material) 90 cm 17 - 20 cm (thickness) 200 cm or national standard Delivery charge Mattresses with pocket springs, mattresses with integrated wooden frame, mattress with comfort zones Label, if any; dimensions	

3.4. Survey framework – coverage (cities, rural-urban, provinces-regions)

Synergy already exists to some degree between CPI and ECP/ICP in the survey framework in terms of:

a) Locations

For the locations, there are some, albeit limited, synergy between the sampled locations of the CPI and ECP/ICP for the reasons listed below.

For the ECP/ICP, prices are collected in the capital city of the UK, from ten established locations based primarily on 'hot spot' analysis and the knowledge and experience of the PPP price collectors. It would be too resource intensive to conduct a nationwide survey for each PPP consumer survey. However, the requirement for ECP/ICP is to produce annual national average prices and therefore correction coefficients in the form of Spatial Adjustment Factor (SAFs) are applied to the city prices to arrive at annual national averages.

Prices for the UK CPI are collected nationally from approx. 141 locations across the UK. Location selection takes place separately within each region in the UK, using PPS (Probability Proportional to Size) systematic sampling with a size measure of the number of employees in the retail sector. The number of locations in each region is determined as the proportion of national expenditure that takes place in that region, multiplied by the total number of locations to be visited nationally.

That said, however, there are several locations within the city of London that are sampled for both the CPI and ECP/ICP.

b) Outlets (both retailers and service providers)

Synergies exist for location sampling for both the CPI and ECP/ICP where outlets are selected by

PPS sampling or if this is not necessary then by simple random sampling (SRS). The actual sample selected for outlets for both CPI and ECP/ICP is primarily the same, except for possibly the small independents where random sampling is used or often the outlet is sampled based on the knowledge of the price collector and the relationship that they have built with the owner of the shop.

c) Items

Price data is collected for around 700 items for use in the UK CPI compared with around 2,500 items across the ECP consumer surveys. There is therefore an immediate disadvantage in that the sample of CPI items is far less than the ECP sample which in turn makes the scope and extent of synergy of the items more difficult. It is also extenuated by the fact that the ECP/ICP baskets include both representative and non-representative items. The national CPI basket, as you would expect, consists of representative items.

However, there is scope for NSIs to influence the content of the basket of goods and services. The current practice for updating the ECP basket is that prior to any new ECP survey, proposals are put forward by participating countries for new items. This is to allow for changes in consumer spend in the intervening three years before each survey.

For the CPI, for most goods, the selection of items within outlets is purposive (the exception being some goods, where local probability sampling is applied). In each sampled outlet, collectors in the field choose one variety representative of what consumers would typically purchase in that area from all items matching the specification of each item to be priced in that outlet. To facilitate this, they ask the retailer what the most popular brands are and those stocked regularly; it is imperative that the same product is priced each month. This is a very different approach to the one used for ECP/ICP items where strict product specifications are adhered to, to ensure the integrity of the produced statistics; this is a major challenge (already covered in Section 3.1 above) and limits possible synergies and therefore integration of CPI and ECP/ICP items.

3.5. Price surveys

Currently different price surveys are undertaken for CPI and ECP/ICP and it is envisaged that this will continue until there is more synergy between them that will allow for integration of some part of the collection and processes.

a) Consumer price index

CPI undertakes a monthly price collection out in the field across 141 locations randomly selected covering approx. 700 items within the UK over a period of 7-10 days depending on the item(s) in question. This survey is primarily conducted by a third-party contractor. Around 300 part time collectors conduct this collection. Ten field auditors employed by ONS validate the collections.

In addition to the collection in the field, ONS also undertakes what's known as *'central'* collection.

This is conducted 'in house' by ONS staff within the CPI production branch and uses various modes, including email and telephone, online collection and brochures.

b) European Comparison Programme/International Comparison Programme

Counties participating in the Programme collect prices for a basket of Goods and Services over a three-year rolling programme (ICP recently aligned to ECP) with two surveys being conducted in any given year. In the intervening years of t+1 and t+2, movements in the CPI is used to extrapolate forward. The consumer surveys are conducted in the capital city, in the case of the UK, London.

4. Statistical operations

4.1 Data collection

Integration of the data collection processes for CPI and ECP/ICP should be relatively straight forward for those items whose price data could be used for both outputs. Historically, collection for both outputs of CPI and ECP/ICP use the same device in their price collection. The same external company that collects data for the CPI supports the devices for both outputs.

Work is currently underway within the UK PPP team to utilize the CPI data to its full capacity. For the CPI, 180,000 prices are collected monthly on a specific day and supplied in two batches. The second is a mop up exercise. Around 750 items are priced, providing more than two million price quotes. Currently around 30,000 price quotes are collected for the six ECP Consumer Goods and Services surveys (over a three-year rolling programme) for the UK.

There is the potential to use this significant and timely dataset for ECP/ICP purposes. For the current PPP consumer survey of 'House and Garden' matching is being undertaken; the aim going forward is to identify those items where synergy exists and once identified CPI data will be used alongside ECP/ICP price data. Initially this 'matching exercise' will be time consuming as primarily it is a manual task but once completed it can be used as a template going forward as only new item proposals for both CPI and ECP/ICP will need to be matched.

The determination of a successful matching of an item will be dependent on several criteria, including the relative homogeneity the price relative to others in the same basic heading, the variation coefficient, use of proxy items etc.

In the medium to longer term however, it is envisaged that scanner data particularly from the key supermarkets in the UK market, will be used for ECP/ICP purposes and work is progressing quickly on this significant development in price statistics. These will be millions of transaction prices and will be used for both CPI and ECP/ICP outputs. New systems for these are already in the design phase, with an infrastructure in place to allow for the ingestion of data from the key retailers.

4.3 Data storage and editing procedures

Currently there is no integration of CPI and ECP/ICP data storage and edit processes. The ECP item list compilation, data entry, validation and aggregation are designed, owned and supported by Eurostat. The software is internet based and is accessed through a secure system. There are three

main tools, namely the Item List Management Tool (ILMT), Data Entry Tool (DET) and Validation Tool (VT). The DET is a standalone application which must be installed on an individual's PC. The only requirement is that JAVA is needed. There is also the Metadata Editing Tool (MET) which allows for the uploading of survey reports. Access to CIRCABC is also required (CIRCABC provides a secured working area to share information of users and interest groups). All countries participating in the ECP submit and edit their data and metadata in this way.

This is in complete contrast to the CPI which uses internally developed and supported systems. Data is transmitted from a third-party company via a secure SharePoint (FTP) site hosted in the UK. The SharePoint service is provided by the third-party company. Data is validated before the point of entry into the ONS and then again once the data has been received from the third party.

5. Administrative structures

5.1 Funding arrangements

The UK is primarily currently funded by Eurostat to deliver the outputs of the ECP. The funding amounts to 70% of the total cost of delivering all the outputs. However, there is a risk that if the UK leaves with a 'no deal' BREXIT, funding will be withdrawn. It is therefore imperative that going forward that the UK utilizes its current resources, including price data to its full effect.

5.2 Establishment of ECP/ICP units within CPI structure

Because of the close synergies between ECP/ICP and CP, there are moves underway to integrate the PPP and CPI teams within Prices division. This is overlap of work at a fundamental level, primarily the price collection which is the most resource intensive.

6. Benefits of CPI-ICP integration

6.1 Enhanced sustainability of International Comparison Program

The major benefit of integration of the CPI-ECP/ICP is one of resource, both financially and time which in turn would ensure the sustainability of the ICP. The aim would be to collect a price that could be used for multiple purposes.

6.2 Improvements from ICP processes to CPI and improvements to ICP from CPI processes

From a UK perspective at least, improvements from the CPI will flow into the ECP/ICP rather than vice versa. Historically, the CPI has always taken priority regarding finances, time and developments. As such and to fully utilize the significant amount of price data available, the ONS is actively developing the way prices are collected using alternative data sources as opposed to the current method of collecting prices for both CPI and ECP/ICP via the high street 'on foot', on line (via company websites) or telephoning retailers and service providers.

6.3 Statistical capability building

It is important that any organization ensures that it continues to develop and build its statistical

capability. Economics Statistics within ONS, the arm of which is responsible for producing economic statistics, including consumer price collection for the CPI and ECP is an environment that is ever changing. Economics statistics is currently undergoing a transformation that will define a structure that will allow ONS to deliver its commitments whilst adhering to the constraints of the budget. The aim is to have a committed and highly skilled workforce that will deliver what stakeholders require and in a timely manner.

Within the remit of the European Comparison Programme, the UK has through grant funding continued to develop its knowledge and further its capability by sharing best practice with several countries within the Programme. The UK has both hosted and been visitors to many countries such as Spain, France, Denmark, The Netherlands, Germany, Portugal and Ireland. This engagement with countries within the Programme is instrumental in building the capability of the UK PPP and indeed other countries and is a practical solution to helping those less developed countries in terms of practices and processes.

7. Conclusions and future plans

If synergy exists between CPI and ECP/ICP then there is a greater chance of successful integration, even if that integration is limited. This is important that to ensure the sustainability and future of the ECP/ICP.

It is also important to note that from a UK perspective integration is more likely to come from the use of alternative data sources such as web scraped, and scanner as opposed to the more traditional sources (as already covered above). To enable this to happen the following needs to be actioned:

- Look at further integrating CPI and ECP/ ICP, outside the spatial adjustment factor exercise which is conducted once every six years.
- Continue to logistically situate the teams responsible for both PPPs and CPI within the same command. This close relationship is key in ensuring the success of any future integration of PPPs and CPI for the purpose of price collection. The intention is to amalgamate the CPI and PPP teams under the command of one statistician, whereas currently it is under the command of two separate ones. These close links will bring price collection for consumer goods and services under one 'umbrella' which by default should bring synergies between CPI and PPPs.
- Identify those key retailers and service providers that appear to have national pricing. National pricing is where a retailer or service provider regardless of where it is located regionally will charge the same price for a good or service. Conduct analysis on the price observations. This could benefit both CPI and PPPs.
- In addition to integrating CPI and ECP/ICP is it imperative that any new developments in technology is considered when collecting prices with the aim of using the same prices for

different outputs. *'The aim is for one price to fit all'.*

- With improved synergy or integration between ECP/ICP and CPIs will come the significant benefit of being able to produce regional price levels which will be able to demonstrate the difference in price levels, relatively speaking, between regions and, in the case of the UK, composite countries of England, Wales, Northern Ireland and Scotland.
- By using the three-year rolling approach, Eurostat can make annual comparisons that provide PPPs and real expenditures for each level of aggregation, including basic heading, up to GDP level. However, in the interim years of a survey which is conducted in period t, the intervening t+1 and t+2 data are extrapolated using the movements in the CPI data. Fortunately, both PPPs and CPIs are classified according to Classification Of Individual Consumption by Purpose (COICOP) which makes this exercise relatively straightforward.

CPI/ICP case study: South Africa

1. Introduction

In South Africa, the statistics office used its own staff, processing systems and resources to collect ICP pricing data. In doing so, it identified elements of the ICP process that have been implemented as improvements for its own CPI. These improvements will further streamline collection of ICP price data in future rounds.

2. Background

The methodology employed in collecting data should always be tailored to the purpose of the intended output. While the inputs to a CPI and PPP are ostensibly the same – prices – their intended use sets up differentiated requirements for their collections. For this reason it is useful to compare the definitions and purposes of a CPI and PPP.

In most African countries the ICP was funded by the World Bank and the African Development Bank (AfDB) as a separate programme, enabling extensive country participation. However, this may have led to the ICP being seen as an add-on with limited incentive to integrate it into existing operations.

South Africa, on the other hand, used its own permanent staff for ICP operations and did not request or receive any AfDB funding. Improved integration of the ICP work with the regular CPI work was therefore necessary to ensure achievement of both areas of work.

3. Product selection

The South African ICP basket was determined by first checking the common products in the CPI and ICP baskets. The data are extracted from the CPI database and specific restrictions (e.g. outlet type, units of measurement, brand, etc.) are filtered per product. This process ensures that the exact required ICP product is matched with the correct CPI product.

The other products might be available in the country but not in the CPI basket. These products are collected by price collectors during the CPI collection as an extra collection. It was possible to accommodate this additional work into the schedules of the permanent CPI price collectors.

During the ICP 2011 round, there were 1,032 household products to be collected. South Africa collected a total of 585 products, of which 369 were common ICP-CPI products and the remaining 216 were collected in addition.

As a result of the different approach to specification, it happens that a number of ICP products may be priced under a single CPI product description. For example Basmati, white and Jasmine rice are separate ICP products but are all eligible for the CPI category of rice. Consequently, a manual matching process is undertaken in the first month of the ICP round to identify relevant items priced for the CPI.

Due to the greater flexibility in product choice for the CPI, product specifications such as brand and

product names are captured in a free text description field. This gives rise to numerous spelling errors and reduces our ability to conduct deeper analysis of price behavior of identical products. However, the stricter ICP approach has illustrated the benefits of ensuring standardized capturing of names and product sizes. Revisions are currently being made to the CPI forms and capturing system to provide for drop down lists to provide for this. It is anticipated that this improvement will assist ICP validation in future rounds.

4. Outlet selection

Together with the price and the product specifications, the outlet type is a key characteristic for ICP collection (at least in Africa). To maintain comparability across countries, prices should be collected from the same outlet type.

For CPI, type of outlet is not specified, and purposive sampling is used for selection of outlets. That is, any outlet that carries the required product may be selected.

This restriction on the type of outlet in ICP limits the number of products that can be used from the CPI. Even if the products are available in the CPI basket or in the country, they might not be included in the country's ICP basket because of a mismatch of type of outlet.

It was for this reason that South Africa decided to include a field for type of outlet in the household expenditure survey and the CPI collection forms following the 2012 reweighting exercise. Categories of chain store, independent stores and informal markets were introduced. Despite the fact that these outlet types are not identical to the ICP (supermarket, specialized stores, department stores, wholesale stores, discount stores etc.), they do provide a step towards better alignment and allow for analysis of pricing behavior across different outlet types. There is still opportunity for expanding the outlet types for CPI collection since this will ensure that the prices are not biased to specific types of outlets. We have noted that most prices in the CPI are from chain outlets since these are pervasive and easy to collect from.

5. Price collection

Prices are collected by both field-based agents (mainly for goods) as well as head office staff (mainly services).

The collection of data in the CPI utilizes the following forms:

- Outlet Cover Page, used to capture data on the outlet status, address, the responsible person for collection and quality control.
- Structured product description form (SPD), used to initiate a new product selected for pricing according to specifications.
- Pricing form, used to price products that were previously initiated (selected for pricing).

These forms were designed during a substantial re-engineering of the CPI in 2005. The SPD form was adopted from the ICP 2005 round and it has been extremely valuable for product initiation. A

variation of this is now also used in the producer price index. Even though the ICP uses spreadsheets for collection, the fields in the spreadsheet correspond to the survey forms designed for the CPI.

For the ICP products which do not form part of the CPI, SPD forms are created and sent to the teams in the field to collect from the same outlets where they are collecting CPI prices. If these products were not available in the existing CPI outlets, new outlets were used. The same CPI publicity methodology is used by fieldworkers when approaching those outlets.

Integration between CPI and ICP is cost effective since there is no need to employ extra collectors and build new systems. However, it is important that price collectors are trained thoroughly for ICP collection so that they understand the different product specifications. Poor understanding on the part of fieldworkers causes delays in the field and results in uncertainties, leading to the wrong item being priced or no price being collected at all.

6. Data processing

After collection, both CPI and ICP forms from the different regions are sent to head office to be captured. Forms are captured on the CPI database, where all editing processes are done following the CPI methodology. At the end of editing, a clean database is ready for any type of analysis. Although the ICP and CPI use different product codes, a correspondence table allows specific CPI items to be extracted using a custom-built SAS program. ICP designed a data-entry sheet to be used for capturing all collected prices. It aims to ensure a homogeneous structure of the datasets across all countries. Following capturing, data are merged by an additional tool which gives as output a country data file.

This data entry sheet is not used in South Africa for capturing purposes to avoid creating different databases for CPI and ICP. Rather, everything is captured in the CPI database and entries required for the ICP are extracted to the ICP data-entry sheet. This means that only data that have passed the CPI quality-validation processes are imported into the ICP data-entry sheet. This process results in speedier validation of ICP data.

The data entry sheet provided lessons for the CPI. Since the sheet contains protected cells to avoid mistakes and guides the user during the entry of data, these functions have now been built into the reviewed CPI capturing system where many of the fields will now have drop down lists to choose from. In this way, errors are avoided at an early stage.

7. Conclusion

Resistance to change and integration is common because introducing something new is usually perceived as extra work. Integration between the CPI and ICP in South Africa has proven to be a valuable exercise. Integration has allowed the ICP collection to be conducted with a minimum of additional effort and no additional resources. It has demonstrated areas for improvement of CPI systems which enhance the quality and range of pricing data. ICP has further provided opportunities for research work such as calculating sub-national PPPs.