

Phone Tree Surveys and the Wisdom of Crowds

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Motivation

How can we measure wellbeing in hard-to-reach areas?

Conflict

Infectious disease outbreak

Environmental disaster

State interference

Poor infrastructure

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Phone surveys offer one way forward

Phone surveys in economics

Existing approaches to sampling for phone surveys (Gourlay et al. 2021):

- i. Use respondents from a prior in-person survey
- ii. Random digit dialing
- iii. Administrative data with contact information

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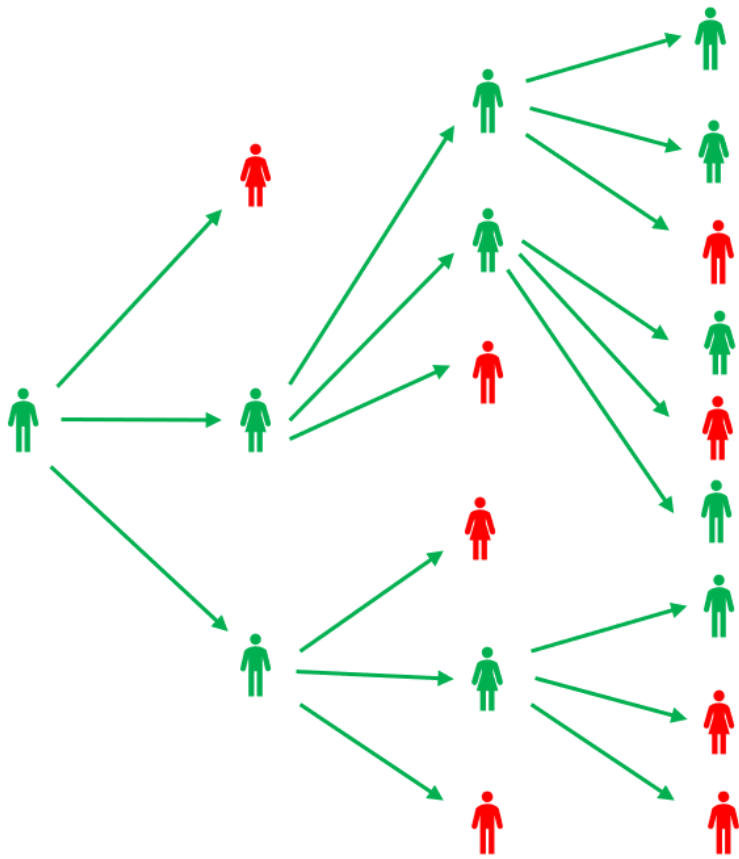
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In this paper we develop and test an alternative approach that we call “Phone Tree Surveying”

How it works

Phone Tree Sampling



1. Reach out to “seeds”—people who can be reached through the networks of the research team—and ask them to suggest potential respondents
2. Call those respondents. Conduct the survey. At the end, request referrals for additional respondents.
3. Referrals are requested in a stratified way, e.g., “Could you recommend a woman, aged 30-50, who is a farmer, in X location”

Study design

Goal: Measure food security in two districts of Malawi

Outcome variable: Household Hunger Scale (HHS), index from 0-6

Data collection:

- [1] Rapid Feedback Monitoring Study (RFMS): existing high frequency panel survey of food security in the study districts (Benchmark)
- [2] Phone Tree Survey: our team uses the phone tree method, from a central office, to reach rural households in study area (Goal of project)
- [3] Traditional Phone Survey: phone survey with randomly sampled households from RFMS villages (Useful for mechanisms)

Timing:

- Round 1: April 2024
- Round 2: June 2024
- Round 3: July-August 2024
- Round 4: November-December 2024

Estimating bias

To assess bias from the Phone Tree approach we estimate:

$$HHS_{idt} = \beta_1 PhoneTree_{id} + \gamma_d + \delta_t + \varepsilon_{idt} \quad (1)$$

using only the Benchmark and Phone Tree data

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Three possible sources of bias:

- [1] Composition (phone ownership Y/N)
- [2] Sampling method (phone tree vs. traditional)
- [3] Modality (in-person v. phone)

Decomposing bias

With the three concurrent surveys we can compare mean HHS between four groups:

1. Traditionally sampled, in-person surveyed, no phone access
2. Traditionally sampled, in-person surveyed, phone access
3. Traditionally sampled, phone surveyed, phone access
4. Phone tree sampled, phone surveyed, phone access

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We estimate:

$$HHS_{idt} = \beta_1 PhoneTree_{id} + \beta_2 StandardPhoneSurvey_{id} + \beta_3 TraditionalWithPhone_{id} + \gamma_d + \delta_t + \varepsilon_{idt} \quad (2)$$

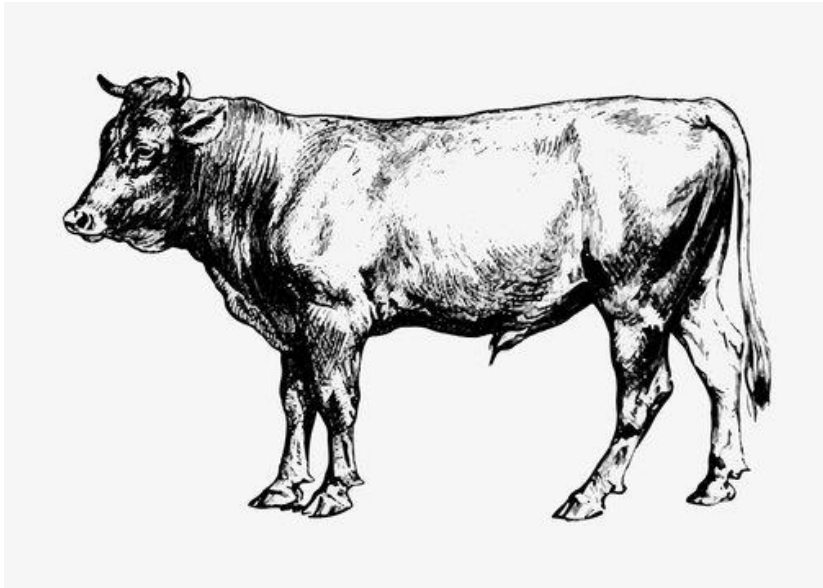
The wisdom of crowds

Distribution of the estimates of the dressed weight of a particular living ox, made by 787 different persons.

Degrees of the length of Array 0°—100°	Estimates in lbs.	Centiles		Excess of Observed over Normal
		Observed deviates from 1207 lbs.	Normal p.e = 37	
5	1074	- 133	- 90	+ 43
10	1109	- 98	- 70	+ 28
15	1126	- 81	- 57	+ 24
20	1148	- 59	- 46	+ 13
<i>q</i> ₁ 25	1162	- 45	- 37	+ 8
30	1174	- 33	- 29	+ 4
35	1181	- 26	- 21	+ 5
40	1188	- 19	- 14	+ 5
45	1197	- 10	- 7	+ 3
<i>m</i> 50	1207	0	0	0
55	1214	+ 7	+ 7	0
60	1219	+ 12	+ 14	- 2
65	1225	+ 18	+ 21	- 3
70	1230	+ 23	+ 29	- 6
<i>q</i> ₃ 75	1236	+ 29	+ 37	- 8
80	1243	+ 36	+ 46	- 10
85	1254	+ 47	+ 57	- 10
90	1267	+ 52	+ 70	- 18
95	1293	+ 86	+ 90	- 4

*q*₁, *q*₃, the first and third quartiles, stand at 25° and 75° respectively.
m, the median or middlemost value, stands at 50°.
 The dressed weight proved to be 1198 lbs.

Galton (1907)



Measuring perceptions of HHS in the community

We asked respondents to assess HHS in their village

1. How many households are in your village?
2. In the past week did any households in your village have no food in the house? Y/N
3. [If 2 = yes] How many households experienced this rarely?
4. [If 2 = yes] How many households experienced this sometimes?
5. [If 2 = yes] How many households experienced this often?

We use these responses to estimate each respondent's perception of mean HHS in the village

Research questions

To summarize, we aim to answer the following questions:

1. Can we get the Phone Tree method to work in this context
2. Are the results different from the “gold standard” (RFMS) results?
3. If so, what is the relative importance of composition, sampling, and modality to that bias?
4. Can we mitigate bias by asking respondents about their community instead of about themselves?

Our hope is that this method will be a new part of the research toolkit, especially for rapid response / crisis scenarios

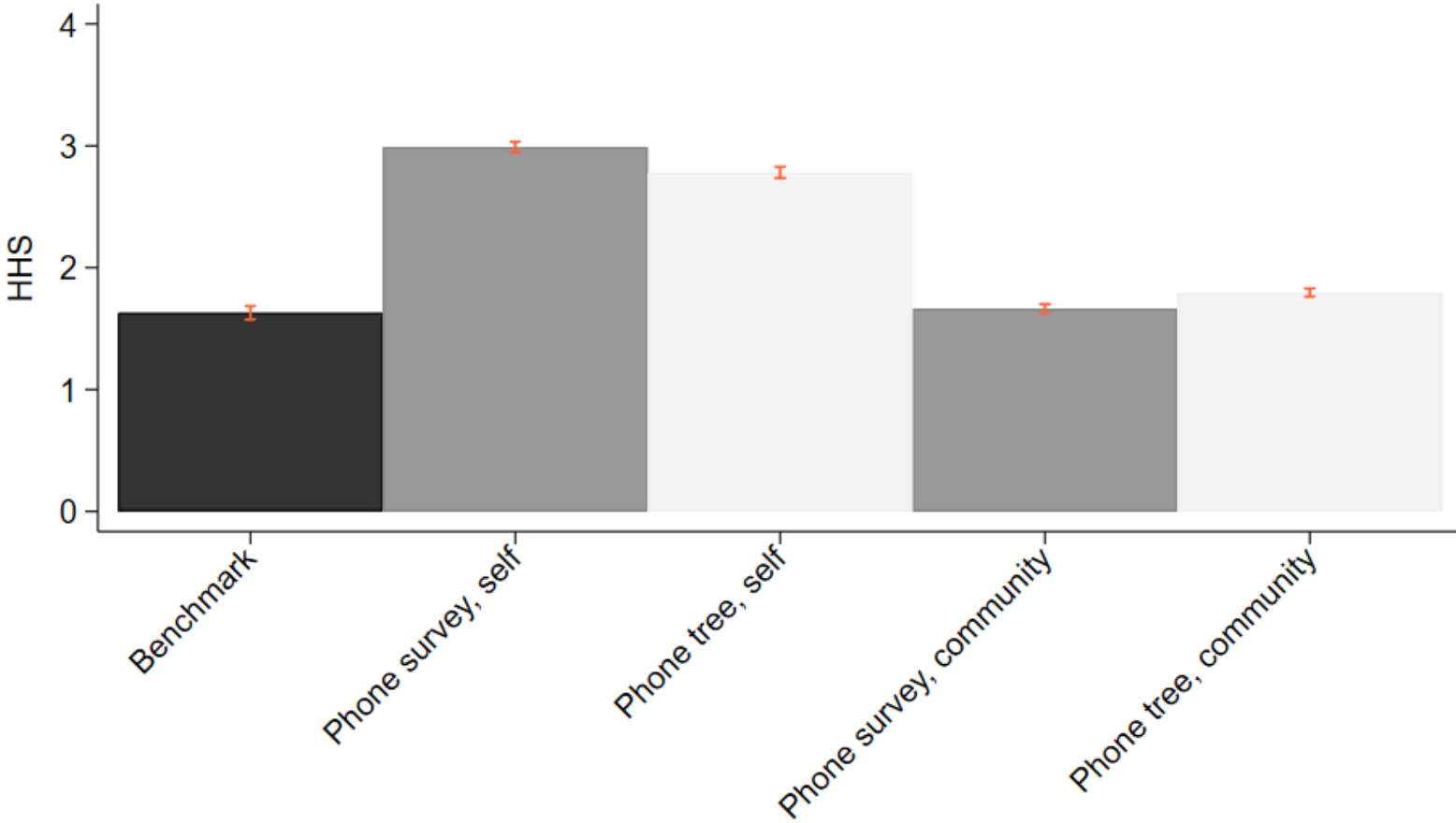
Result 1: Phone Tree sample is not representative

Table 1: Summary statistics and t-tests of equal means

Variable	Means			p-values		
	A. In-person	B. Phone survey	C. Phone tree	A = B	A = C	B = C
	(1)	(2)	(3)	(4)	(5)	(6)
Head is female (=1)	0.27	0.28	0.23	0.67	0.05	0.02
Num. household members	5.75	6.57	6.26	0.00	0.00	0.01
Number of rooms	2.29	2.24	2.54	0.37	0.00	0.00
Asset index	-1.35	0.75	0.58	0.00	0.00	0.00
Electric/solar lights (=1)	0.13	0.10	0.21	0.08	0.00	0.00
Metal roof (=1)	0.57	0.45	0.60	0.00	0.15	0.00
Solid floor (=1)	0.15	0.10	0.29	0.00	0.00	0.00
N	869	844	961			

Notes: Authors' calculations from one round of survey data with each group. Group A is from an ongoing, monthly, in-person survey of households that were sampled using a traditional face-to-face listing survey. Group B respondents were sampled in the standard fashion but interviewed over the phone. Group C respondents were sampled using the phone tree method of acquiring referrals over the phone, and interviewed over the phone. Group A data are from December 2023 survey; Groups B and C are from March 2024. Columns 1-3 report mean values of variables by group. Columns 4-6 report p-values from pairwise t-tests of equal means.

Result 2: Self-reported HHS biased *upwards*, Community-perception HHS unbiased



Result 3: Bias is due to modality

Table 2: Survey Method Effects and Bias Decomposition

Respondent answers for:	Self (1)	Self (2)	Community (3)	Community (4)
Phone tree survey (=1)	1.13*** (0.16)	1.10*** (0.17)	0.16 (0.15)	0.13 (0.17)
Standard phone survey (=1)		1.34*** (0.17)		0.01 (0.17)
Traditional survey, respondent has phone access (=1)		-0.05 (0.19)		-0.05 (0.19)
Observations	4873	7287	4871	7285
R-squared	0.16	0.20	0.02	0.01
Mean of dep var, omitted group	1.63	1.67	1.63	1.67
Traditional survey w/ phone = Standard phone (p-val)		0.00		0.79
Standard phone = Phone Tree (p-val)		0.00		0.05

Result 4: Bias is primarily on extensive margin

Table 3: Decomposing reporting differences: extensive and intensive margins

HHS Component	Rate of "Yes" (1)	Mean severity if yes (2)
A. Benchmark		
No food in house	0.63	1.06
Go to sleep hungry	0.56	1.05
Did not eat for a full day	0.35	1.07
B. Phone Survey, Self-report		
No food in house	0.95	1.19
Go to sleep hungry	0.93	1.12
Did not eat for a full day	0.77	1.06
C. Phone Survey, Community Assessment		
No food in house	0.58	1.24
Go to sleep hungry	0.47	1.22
Did not eat for a full day	0.31	1.20
D. Phone Tree, Self-report		
No food in house	0.92	1.15
Go to sleep hungry	0.88	1.14
Did not eat for a full day	0.69	1.05
E. Phone Tree, Community Assessment		
No food in house	0.64	1.22
Go to sleep hungry	0.51	1.21
Did not eat for a full day	0.32	1.19

Modality experiment

In round 4 we randomized the Traditionally Sampled Phone Survey group into:

- (a) Phone Survey
- (b) In-person Survey

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Table 4. Round 4 Modality Experiment (t-tests)

	In person	Phone survey	Difference	p-value
HHS self-report	2.42	2.91	-0.49***	0.000
HHS community	1.49	1.43	0.06	0.281
N	812			

Summary and Conclusion

1. Can we get the Phone Tree method to work in this context
Yes
2. Are the results different from the “gold standard” (RFMS) results?
Yes, but in the opposite of the direction we hypothesized
3. If so, what is the relative importance of selection, sampling, and modality to that bias?
Almost all bias is due to modality
4. Can we mitigate any bias by asking respondents about their community instead of about themselves?
Yes – community responses are unbiased

Our hope is that the Phone Tree + Community Perception approach proves to be useful for rapid assessment of wellbeing during crises

Whether the Phone Tree method can also be used for more general surveys (with reweighting) remains to be seen

Thanks for your attention and feedback.

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