RaMMPS

Rapid Mortality Mobile Phone Surveys

MPS selection bias in mortality and RH estimates

Georges Reniers, London School of Hygiene and Tropical Medicine

GFF & JHU webinar series on MPS for RMNCAH&N

Session 3, Part 2: MPS methodology, Jan 28th 2025

Outline

RaMMPS
Rapid Mortality Mobile Phone Surveys

Background and objectives of the RaMMPS project

Acceptability & feasibility of mortality MPS

Sample selection bias & representativeness

Further information: the mortality MPS technical package

background and objectives

Background and objectives

RaMMPS
Rapid Mortality Mobile Phone Surveys

During the COVID-19 outbreak, few data sources were available to document the magnitude and impact of the epidemic in LMICs

- Difficult to inform policy responses
- Weak position to claim vaccine share

RaMMPS project objectives: develop and apply methods for collecting mortality data using Mobile Phone Surveys (MPS)

- More detail available here

https://youtu.be/rRWfRHcQFpw?t=95

Advantages of an MPS

- Feasible without in-person contact (e.g., during humanitarian crises)
- Simpler logistics & lower cost

BUT limited experience with mortality MPS to date

- Acceptable ? Methodological pitfalls ? Plausible mortality estimates ?

The RaMMPS project

RaMMPS
Rapid Mortality Mobile Phone Surveys

Starting in December 2020, we set out on a journey

- 13 partner institutions
- Data collection in 5 countries

General approach

- Adopt survey instruments from census and surveys (e.g., DHS, MICS)
  - Birth/Pregnancy Histories for estimating under-5 mortality
  - Sibling Survival Histories for estimating adult mortality
  - Parental Survival Histories for estimating old-age mortality
- National survey + smaller validation studies in each country
- Sampling: Random Digit Dialing (+ other methods)
- Computer Assisted Telephone Interviews (CATI) with trained enumerators

RAMMPS Malawi – questionnaire

BEGINNING OF CALL

NO.	QUESTIONS	CODING CATEGORIES	SKIP
Welcome to the RAMMPS CATI application! The text in BLACK are instructions and should not be read out. The text in BLUE is to be read out loud. Text in GREEN is dynamic content based on respondent's earlier answers. This should not be read. Swipe left on the screen to proceed forward to the next page.			
General Information Get ready in the next screen, you will see the phone number and start making phone calls.			
Select the phone number and make a call. Please make sure you make a call.			
BC1	INSTRUCTIONS: DO NOT READ THIS ALOUD What was the response?	Answered the phone No answer Busy tone Number Not in Use Number (temporarily) Not Accessible Busy tone	L1 EA1
BC2	ENUMERATOR INSTRUCTIONS (do not read aloud): Make sure that you crosscheck that you called {phone number}. If you did not, go back to the previous page and then call that phone number.	Swipe through this screen once the number has been crosschecked.	EA1

Available from:
https://www.datafirst.uct.ac.za/dataportal/index.php/collections/RAMMPS

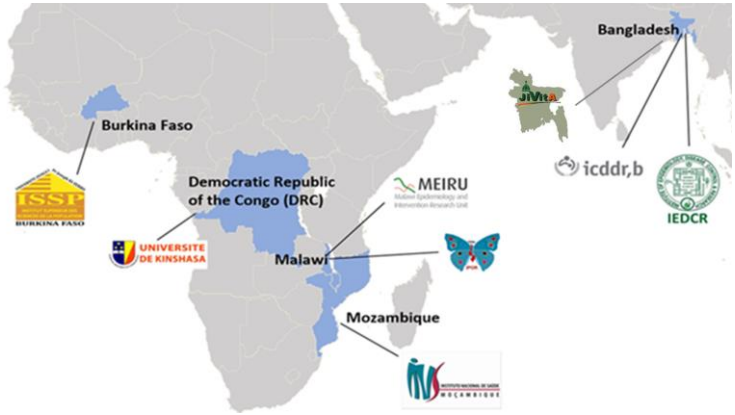
RaMMPS fieldwork summary

RaMMPS
Rapid Mortality Mobile Phone Surveys

Country	National Survey	Other/validation studies
Bangladesh	• Fieldwork: 22Dec2021-31Jul2022 • Sampling: RDD • N =22,678 • Implemented by IEDCR	• MATLAB validation study (adults), N: 2214 • JiVitA validation study (N=1,835) • Proxy pregnancy histories
Burkina Faso	• Fieldwork: 29Nov2021-24Oct2022 • Sampling: RDD + EHCVM* • N= 12932+ 8,407 • Implemented by ISSP	• Ouaga HDSS validation from 07Dec*2022 to 21Jan2023*
DRC	• Fieldwork: 30Aug2021-22Aug2022 • Sampling: IVR + RDD • N=11,924 • Implemented by UNIKIN	
Malawi	• Fieldwork: 24Jan2022-28Jul2023 • Sampling: RDD + IVR screening • N=13,522 • Implemented by IPOR	• Non-inferiority trial (N=1,680) • KHDSS-MPS validation study (N=2,045) • Proxy pregnancy histories (N=500) • Cyclone Freddy follow-up interviews (N=5,128)
Mozambique	• Fieldwork: 23Jun22-19Dec22 + 9Mar22-12Aug22 • Sampling: RDD (with IVR) + COMSA • N=11,116 +13,545 • Implemented by INS	• Qualitative data collection in Dec 2023

* Enquête Harmonisée sur les Conditions de Vie des Ménages

RaMMPS countries and implementing partners



- **Over 90,000 Mortality MPS completed**

(end 2021 – mid 2023)

acceptability / feasibility of mortality MPS

Acceptability: mortality MPS non-inferiority trial

RaMMPS
Rapid Mortality Mobile Phone Surveys

Design: Randomized trial to evaluate difference in response patterns between mortality MPS versus control survey on economic activity (Malawi)

Outcomes:

- Cooperation rate (% completing CATI among those randomized)
- Self-reports of negative feelings
- Stated intentions to participate in future interviews

Findings:

- No difference in any of the pre-specified outcomes
- Negative feelings during the interview were generally transitory: three participants (2 in TG; 1 in CG) accepted an offer to speak to a clinical psychologist; None required follow-up thereafter

Conclusion: Mortality surveys are as acceptable as an MPS on a general socio-economic topic

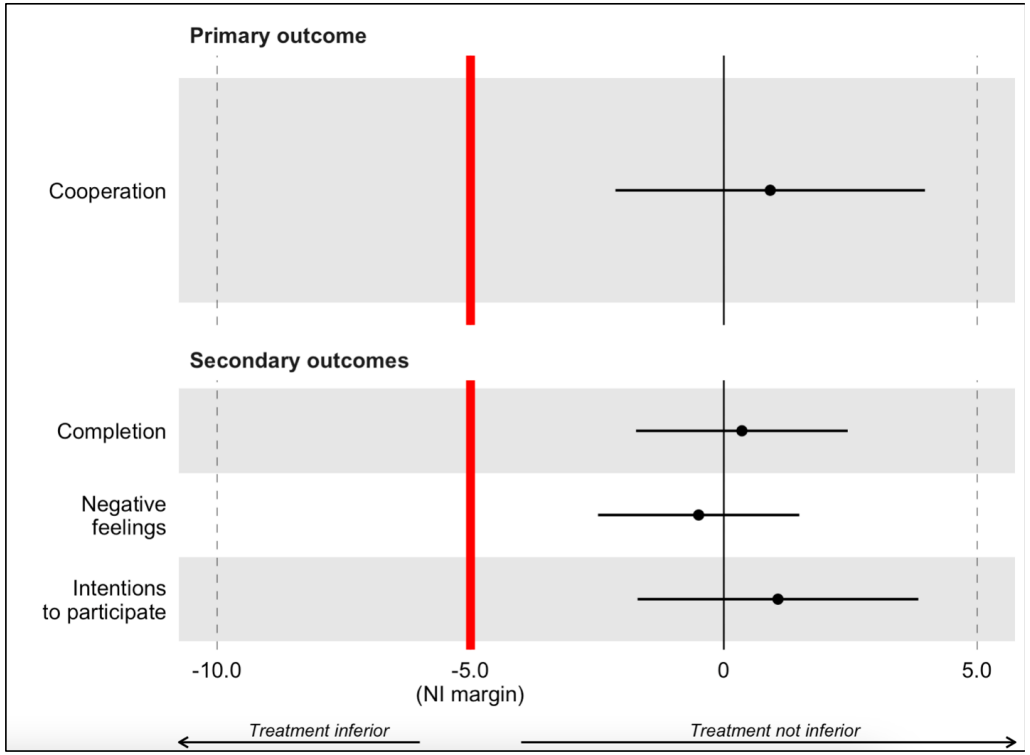


Figure 2: Differences in study outcomes between treatment and control groups
Notes: Values of the x-axis are expressed in percentage points. They are calculated as % treatment group minus % control group. Error bars represent two-sided 95% confidence intervals around the difference in proportions between study groups. The noninferiority criterion is met when the confidence interval remains to the right of the noninferiority margin (red vertical line). Similar results were obtained when calculating one-sided confidence intervals.
NI = Noninferiority.

Source: Chasukwa et al 2022, PLOS Global Public Health

Acceptability: call duration

RAMMPS
Rapid Mortality Mobile Phone Surveys

MPS guidelines suggest keeping interviews short (<20 minutes), but limited empirical evidence

Method:

- ~2500 interviews: random allocation to 10, 20 and 30 minute interviews, ending with Parental Survival Histories
- Comparable cooperation/completion rates (Table1), item non-response (Figure 1) and age heaping (Figure 2)

Findings: No evidence that data quality is lower in longer interviews (up to 30 mins)

Table 1. Primary outcomes, by allocated interview length

	10 min survey	*20 min survey*	*30 min survey*	*Total*
Cooperation rate	96.2%	94.7%	94.0%	95.0%
Completion rate	99.1%	98.0%	97.3%	98.1%

Figure 1. Item non-response in data on ages, dates and registration status by allocated interview duration

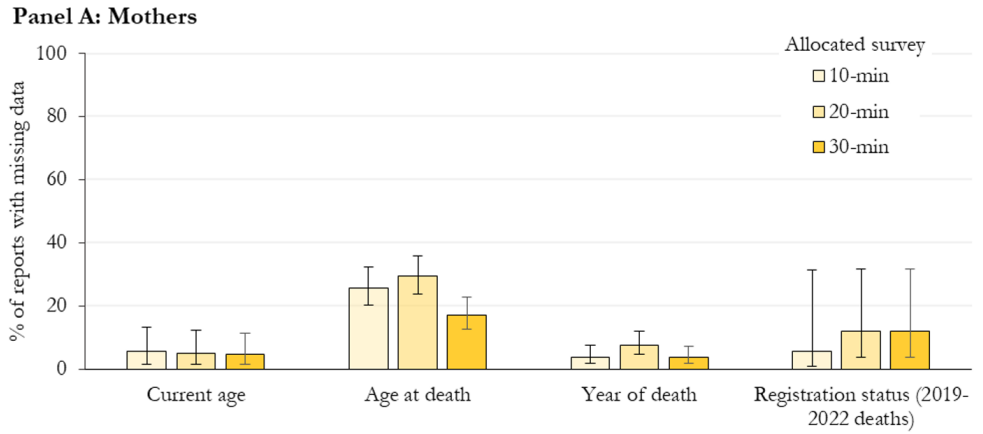
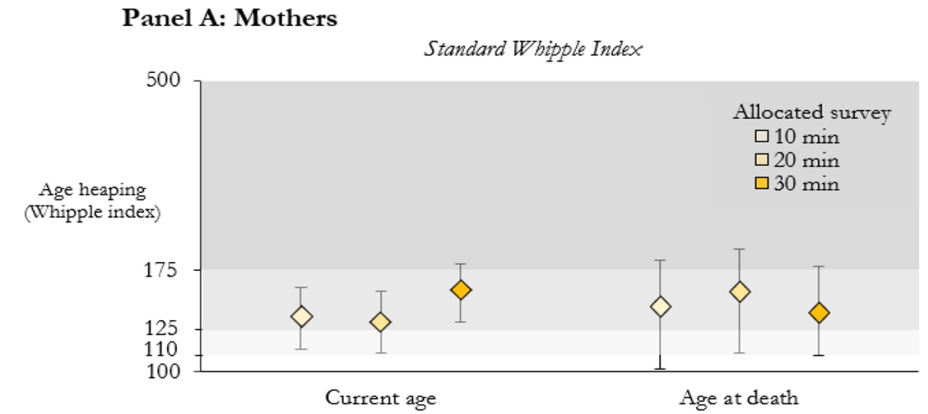


Figure 2. Age heaping indices



Source: Torrisi et al. (2024) Field Methods

MPS CATI costs

RAMMPS
Rapid Mortality Mobile Phone Surveys

Fieldwork operational costs per completed CATI ranged from 14 to 30 USD in Malawi and Mozambique

Differences in cost are largely driven by sampling modality & the mobile phone penetration rate

	Malawi (RDD)	Mozambique (COMSA)	Mozambique (RDD)
Call Attempts	153,767	107,100	81,961
Unique numbers dialed	56,094	48,271	45,573
Completed CATI interviews	13,522	13,545	10,116
Total Costs (US$)	245,133	194,256	307,314
Cost per completed CATI (US$)	**18.1**	**14.3**	**30.4**

Sampling frame with known telephone numbers

Filling quota for population strata with low mobile phone ownership drives up costs

sampling, representativeness and selection bias

The digital divide and sample selection bias

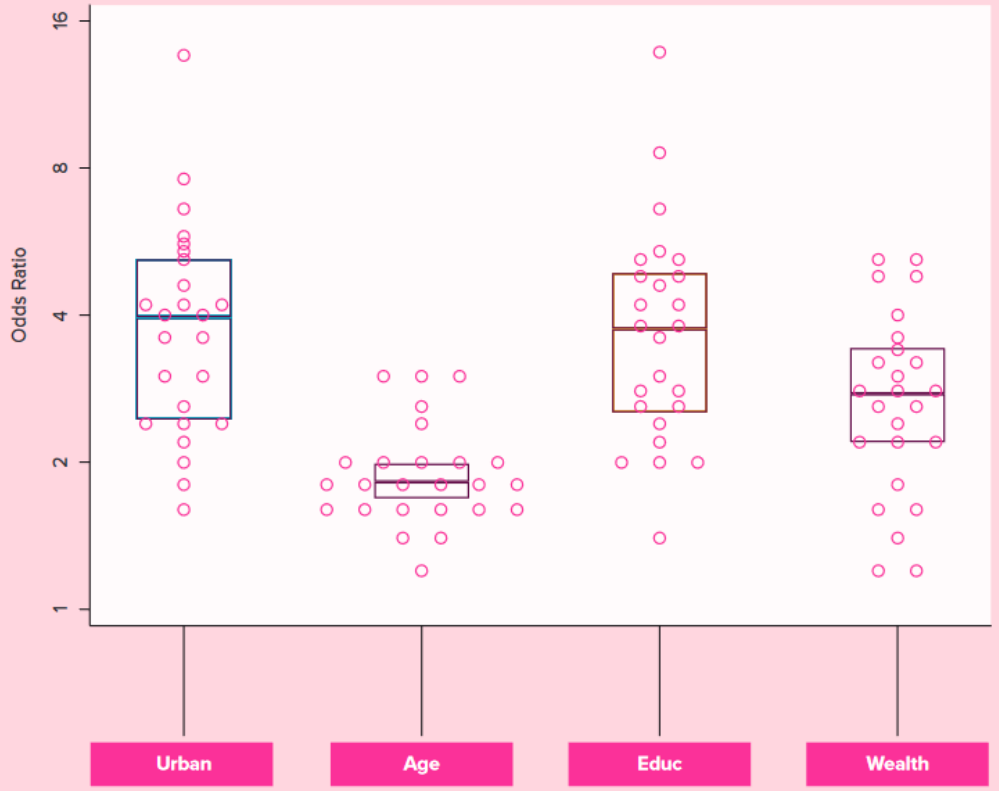
RAMMPS
Rapid Mortality Mobile Phone Surveys

Mobile phone ownership is selective in terms of gender, age, SES, urban/rural residence, …

Procedures to improve representation and alleviate bias

- Impose quotas for a-priori defined population strata, but slows down data collection
- Post-stratification weighting to ensure that the interviewed population is representative in terms of a number of key attributes (e.g., age, sex, place of residence, wealth).

Figure 4: Bivariate associations between women's attributes and mobile phone ownership in 25 Demographic and Health Surveys (DHS)



Notes: Data for women of reproductive age from 25 DHS surveys. Each dot represents the odds ratio for one survey. Variables: Urban (versus rural), Age (25-35 versus younger and older women), Educ (secondary or higher versus lower), Wealth (above versus below the median wealth index score).

Source: https://doi.org/10.17037/PUBS.04673293

RaMMPS studies on selection bias

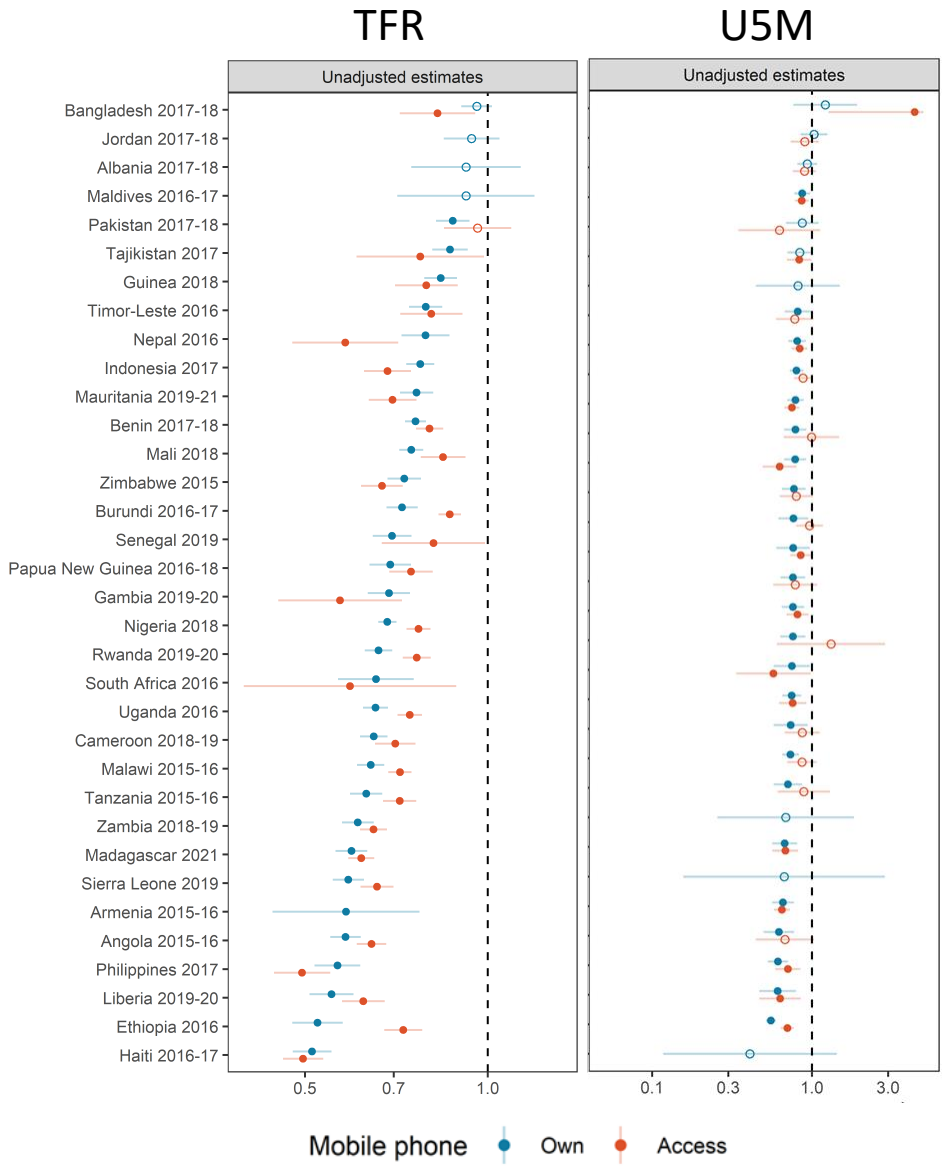
RaMMPS
Rapid Mortality Mobile Phone Surveys

Using data from DHS with information on mobile phone ownership, we evaluated :

- Selection bias that results from (only) surveying mobile phone owners
- Our ability to correct for this bias using post-stratification weighing using basic respondent background characteristics (e.g., education, place of residence, access to electricity, …)
- 3 indicators:
  - The Under-5 Mortality rate (U5M) estimated from birth/pregnancy histories
  - The Total Fertility Rate, estimated from birth/pregnancy histories
  - Adult mortality estimates (45q15), estimated from sibling survival histories

Selection bias in Under-Five Mortality (U5M) and Total Fertility Rate (TFR) estimates

RaMMPS
Rapid Mortality Mobile Phone Surveys



U5M & TFR rate ratios: owners (access) vs non owners

Data come from birth histories collected from women of reproductive age

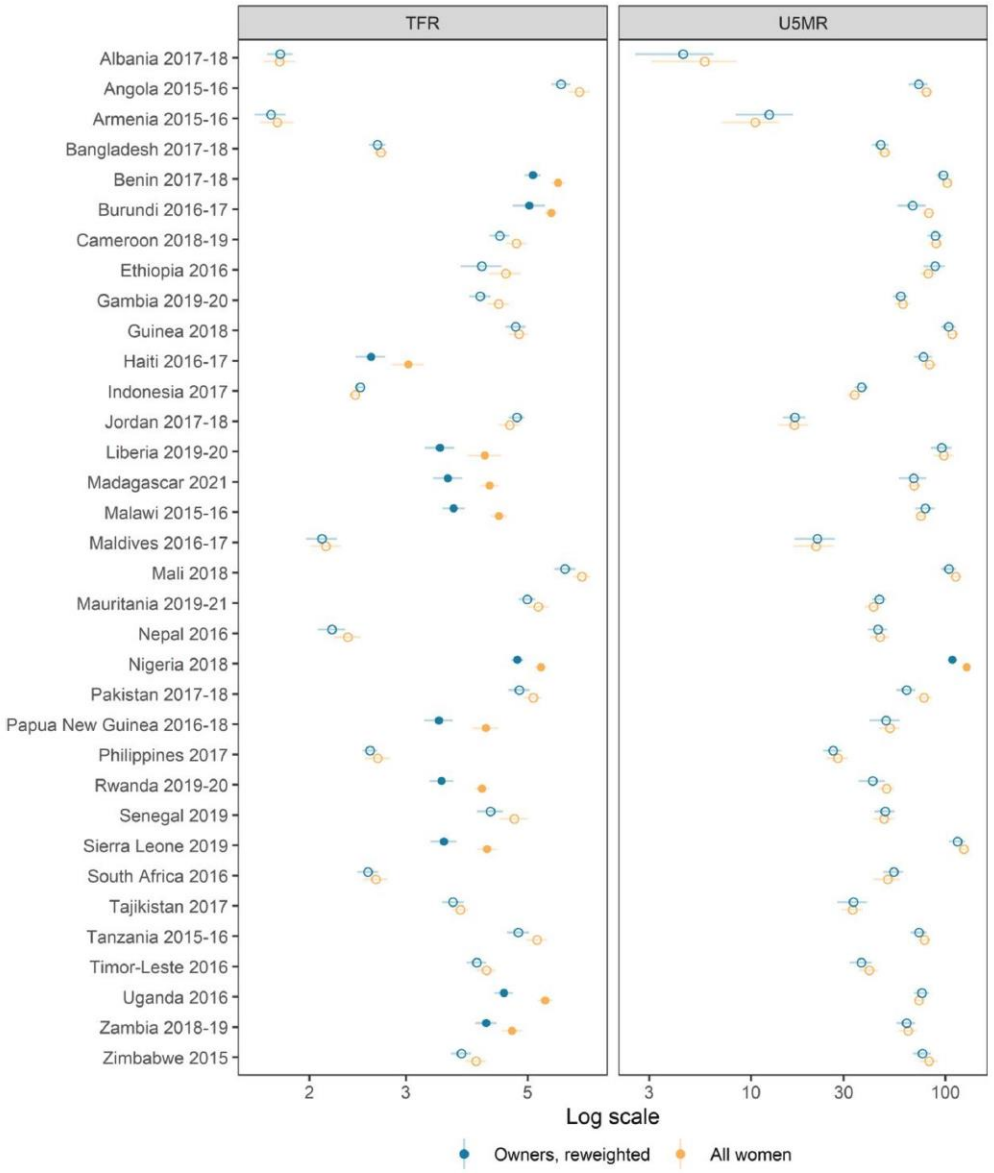
Observations:

- Mobile phone owners (access) have lower fertility + their children have lower mortality
- Exceptions: handful of countries with high mobile phone penetration rates (e.g., Bangladesh, Jordan, Albania, …)

Source: David A Sánchez-Páez et al 2023, BMJ Open

TFR and U5M estimates after weighing

RAMMPS
Rapid Mortality Mobile Phone Surveys



Comparison of the total population estimates for the TFR and U5MR with weighted estimates for mobile phone owners

- 'Raking' weights using age, education, place of residence, household amenities, …
- Solid markers: statistically significant difference

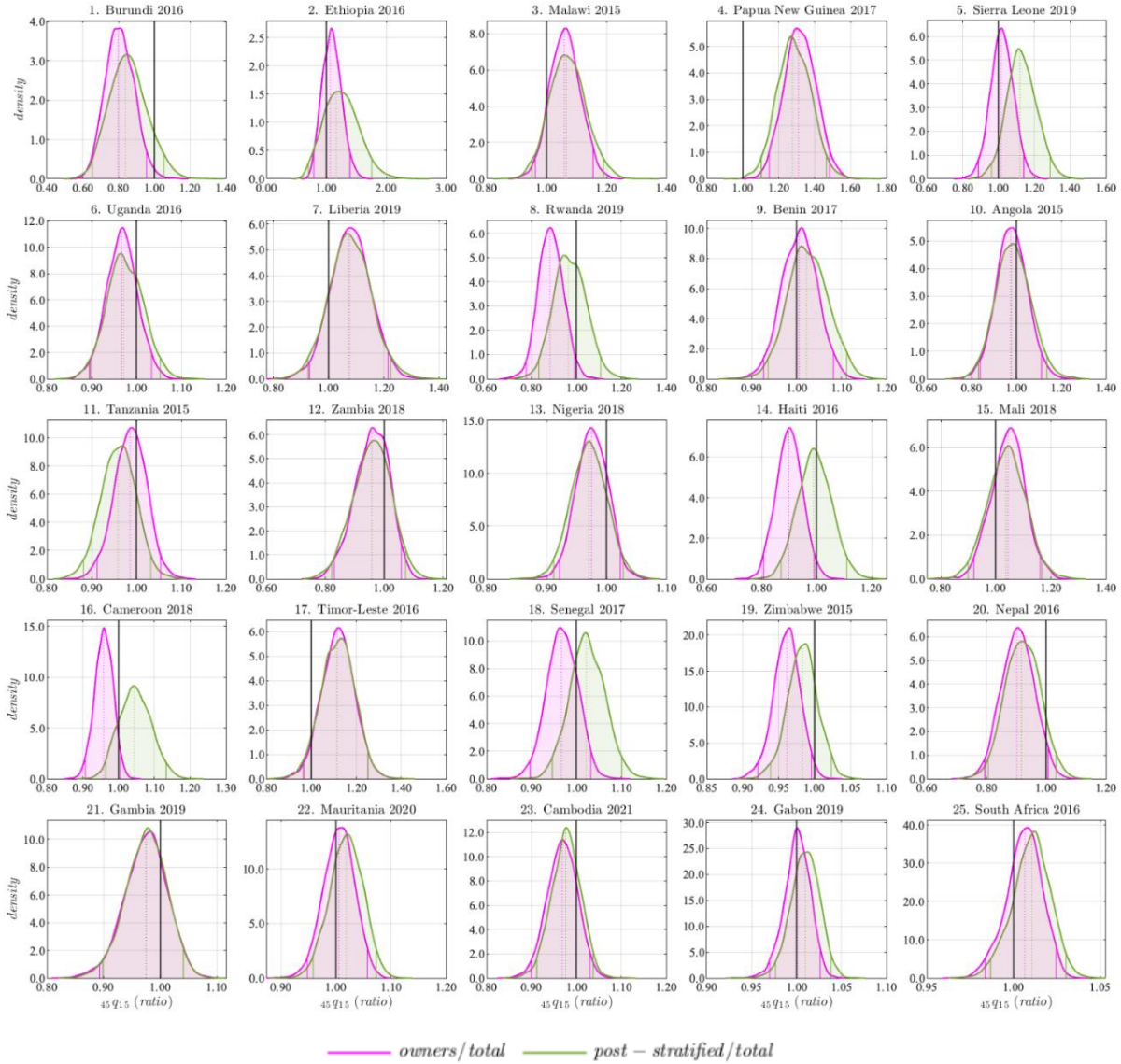
Observations:

- U5M: weighted = total population (1 exception)
- TFR: weighted ≠ total population in 12/34 surveys

Source: David A Sánchez-Páez et al 2023, BMJ open

Selection bias in adult mortality estimates

RaMMPS
Rapid Mortality Mobile Phone Surveys



Ratio of adult mortality (45q15) estimates from mobile phone owners versus the entire sample

Data from Sibling Survival Histories

Bias is limited (pink):

- In 20/25 surveys, the estimate using data from mobile phone owners is statistically equivalent to that of the total population sample (ratio =1)
- Downward bias in 4 surveys, upward bias in 1 survey

Post-stratification weighting (green) alleviates bias, but …

- The correction is typically small
- Not always in the expected direction

Source: Ahmed et al. (2024) Demographic Research

Selection bias – take away messages

RAMMPS
Rapid Mortality Mobile Phone Surveys

Both bias and our ability to correct for sample selection bias depends on the indictor of interest

A. Mortality indicators pertaining to co-resident HH members (e.g., U5M)

- Selection bias should be expected
- Can be corrected with post-stratification weighting on respondent attributes

B. Mortality indicators for relatives who do not necessarily co-reside with the respondent (e.g., adult and old age mortality estimates from sibling and parental survival histories)

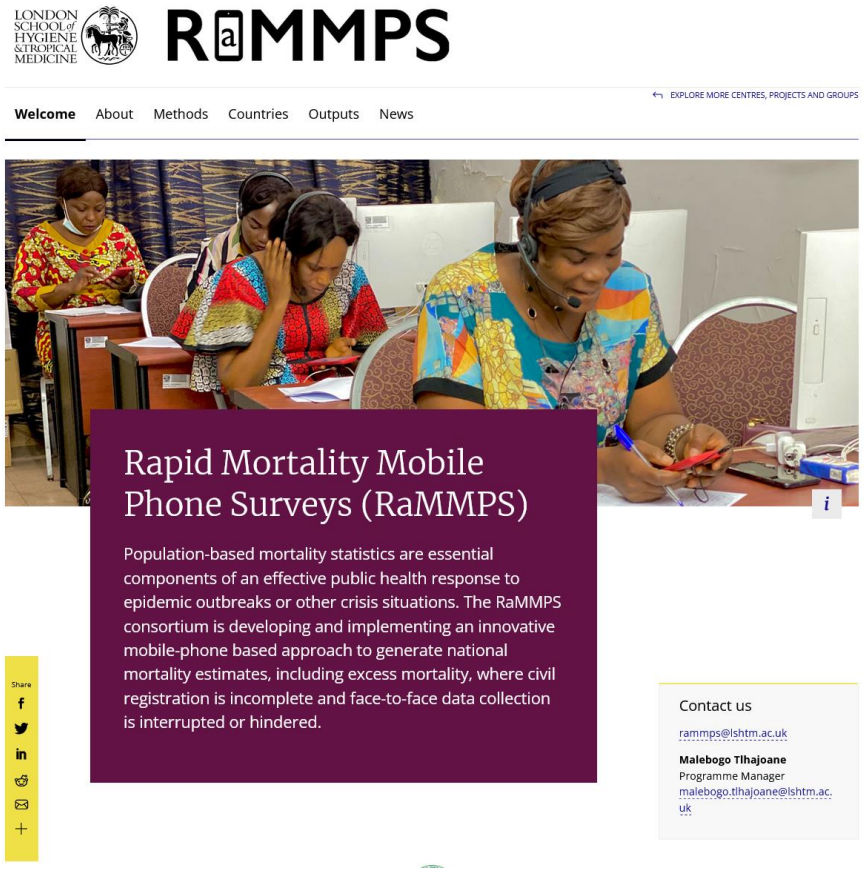
- Selection bias is likely to be smaller or negligible
- Post-stratification weighting (using the respondent's attributes) will do little to correct for this

C. Other indicators (e.g, TFR, contraceptive use, see also Greenleaf et al. 2020)

- Data typically pertain to the respondent and selection bias should be expected
- Are an expression of one's preferences and entail an element of volition → weighting on respondent background characteristics (alone) will not be sufficient to correct for bias.

further information

Project website



Project website: https://www.lshtm.ac.uk/rammps

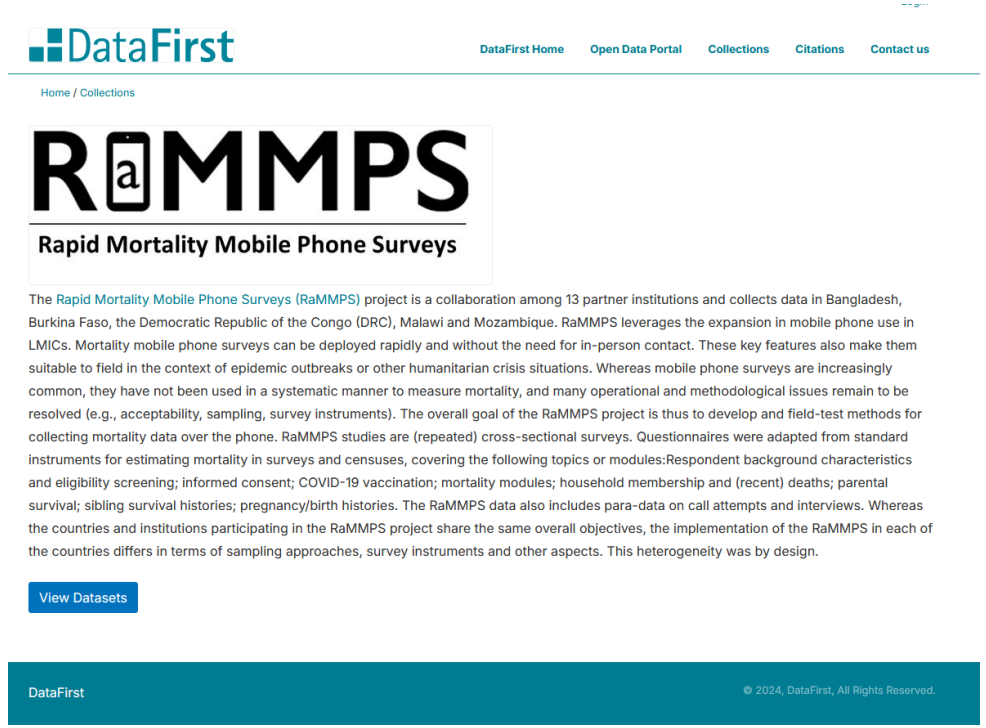
- Project updates
- Contact information

Journal special collections (in progress):

- Demographic Research: *Innovations in measuring adult mortality in countries with incomplete civil registration*, eds. A. Menashe Oren, N. Saikia, and S. Helleringer
- *RaMMPS special collection* in Tropical Medicine and International Health, ed. T. Marchant

Data First repository

Some of the RaMMPS datasets are publicly available via the DataFirst repository; others are in preparation.



https://www.datafirst.uct.ac.za/dataportal/index.php/collections/RAMMPS

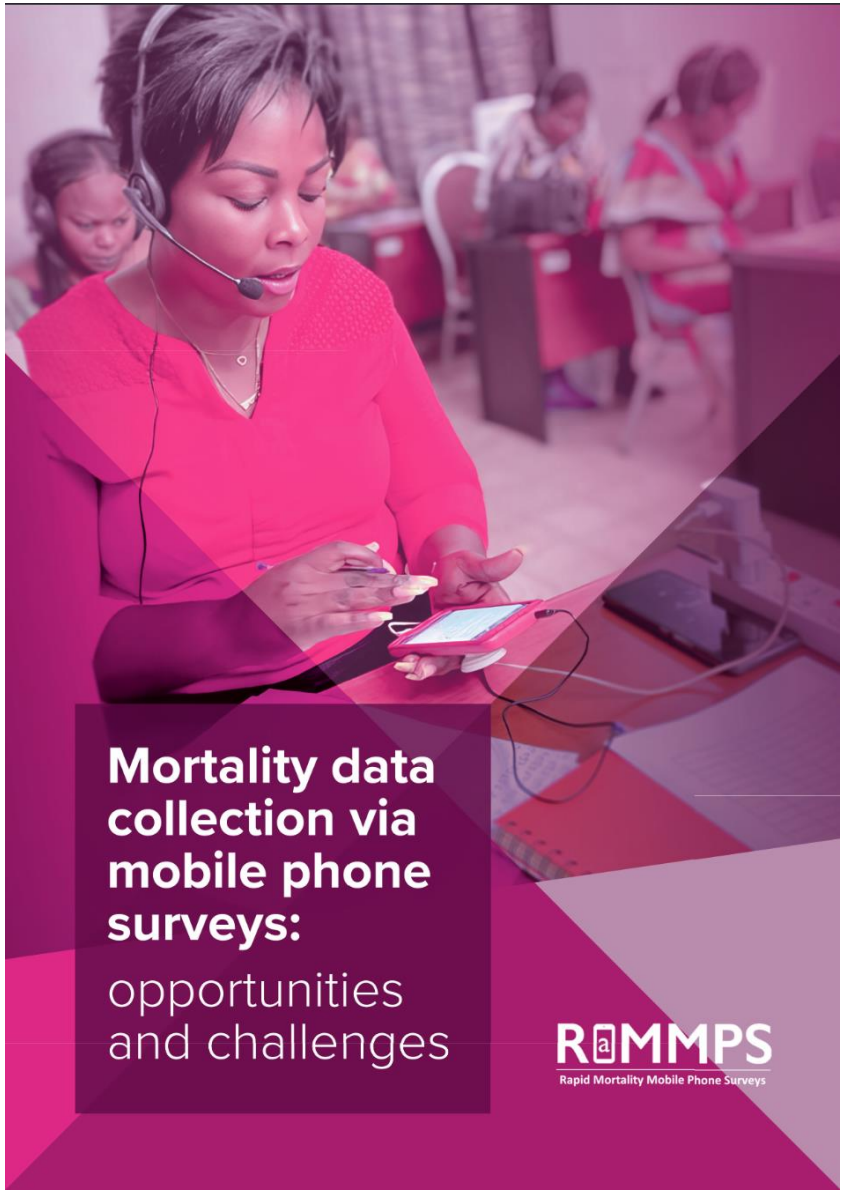
Mortality MPS technical report

RaMMPS
Rapid Mortality Mobile Phone Surveys

Report summarizing some of the key lessons learned from the first three years of the RaMMPS project

Intended as a complement to existing guides on MPS, including Dabalen et al. 2016; Henderson et al. 2020; The World Bank 2020; Gourlay et al. 2021

Available from: https://doi.org/10.17037/PUBS.04673293



Topics covered in the report

1. MORTALITY MEASUREMENT VIA MOBILE PHONE SURVEYS (MPS)

2. ACCEPTABILITY, ETHICS AND GENDER CONSIDERATIONS FOR A MORTALITY MPS

2.1 Acceptability and emotional distress

2.2 Gender considerations

3. SAMPLING IN STAND-ALONE AND COMPLEMENTARY MORTALITY MPS

3.1 Random Digit Dialling (RDD)

3.2 Sampling from existing sampling frames

3.3 Sample selection bias

3.4 Post-stratification weighting

4. SURVEY INSTRUMENTS FOR A MORTALITY MPS

4.1 General considerations in the choice of the mortality survey modules

4.2 Instruments for estimating overall mortality with a short window of retrospection

4.3 Instruments for estimating perinatal and under-five mortality

4.4 Instruments for measuring adult and old age mortality in an MPS

5. CONCLUDING REMARKS

RaMMPS
Rapid Mortality Mobile Phone Surveys

RaMMPS (2024). 'Mortality data collection via mobile phone surveys: opportunities and challenges'.
https://doi.org/10.17037/PUBS.04673293

Thanks !

RaMMPS
Rapid Mortality Mobile Phone Surveys

A ‘selective’ sample of RaMMPS collaborators during a workshop hosted by NYU- Abu Dhabi in January, 2024

funding acknowledgements

BILL & MELINDA GATES foundation
UKaid from the British people
USAID FROM THE AMERICAN PEOPLE
MOMENTUM A Global Partnership for Health and Resilience