

Feasibility and validity of mobile phone-based proxy full pregnancy history (mPFPH) for estimating perinatal mortality in rural Bangladesh



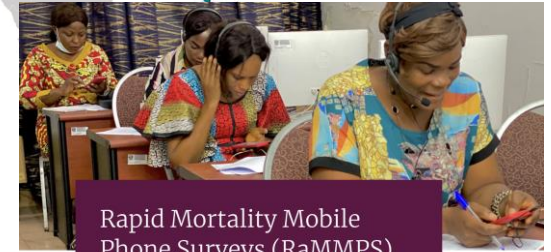
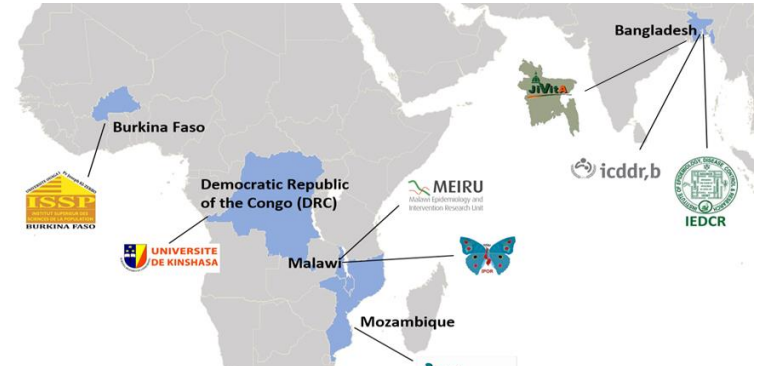
Center for Global
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RaMMPS

Background: Proxy Pregnancy History & RaMMPS

- **Important to validate mortality measures** based on proxy pregnancy history (PPH)
- PPH asks women of reproductive age to report their own **full pregnancy history (FPH)**, as well as the FPH of their reproductive-aged sisters or **closest confidants**
- Only one validation study was done **previously in 1995 in Tanzania¹** to compare proxy and woman's own **full birth history (FBH)** reporting to validate childhood mortality
- **RaMMPS**: Mobile-phone surveys an **innovative approach** to measure mortality



Background: JiVitA RaMMPS study

JiVitA RaMMPS validates two mobile-phone survey methodologies for mortality and pregnancy loss against known mortality loss events during previous JiVitA trials:



1. Validate Rapid Mortality Mobile Phone Surveys (RaMMPS) at the JiVitA Project, using a sample of known, prospectively collected events of infant death, stillbirth and miscarriage as the basis for this validation from the mCARE-II randomized controlled trial.



2. Validate a Proxy Pregnancy History (PPH) reporting methodology that **uses reporting by closest confidants (CC) to ascertain the (index) woman's (IW) pregnancy history** and reporting by **IW to ascertain CC's FPH**, establishing a **two-way validation**.



Methods: RaMMPS study design & analysis



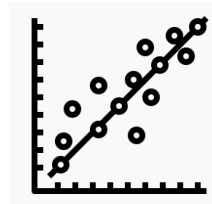
11 trained female callers completed a series of 4 calls per IW-CC pair between June – November 2022.



Callers collected IW and CC FPH using adapted questions from the **Demographic Health Survey (DHS)** (Round 8 Instrument).



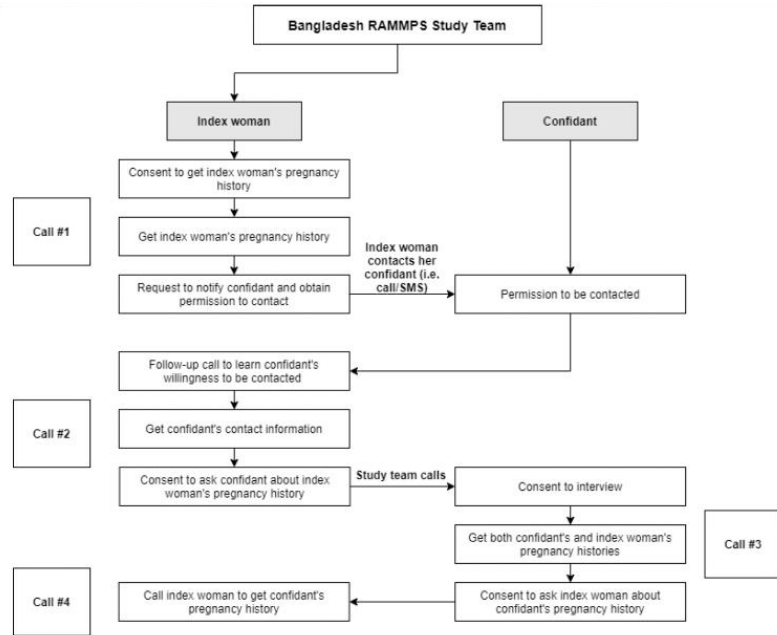
IW FPH information reported by IW (Call 1) and CC (Call 3) were matched by **pregnancy outcome year and parity**



Analyzed 1) **concordance** of IW and CC-reported age of child death and vital status of birth; 2) **misclassification** rate of stillbirths and neonatal deaths



Methods: RaMMPS call schema



JiVitA RaMMPS callers followed a **detailed calling schema** to recruit, consent, and collect mPPFH from IW and CC, the details of which are provided in Supplementary Figure 1.

- **Call 1** obtained the IW's consent, collected their FPH, identified an eligible CC, and scheduled a follow-up
- **Call 2** obtained IW's permission for CC contact and FPH sharing
- **Call 3** collected CC consent, CC FPH, their report of IW FPH, and permission for IW to share CC's FPH
- **Call 4** gathered CC's FPH from IW.

RaMMPS call schema



Methods: JiVitA RaMMPS dashboard

JiVitA Dashboard
 captured daily call progress
 between June-December
 2022 from data collected
 on interviewer's tablets,
 allowing real-time
 monitoring of calls



JiVitA RaMMPS Data Dashboard



Results: IW & CC background characteristics

Closest confidants are younger, and have lower parity compared to index women

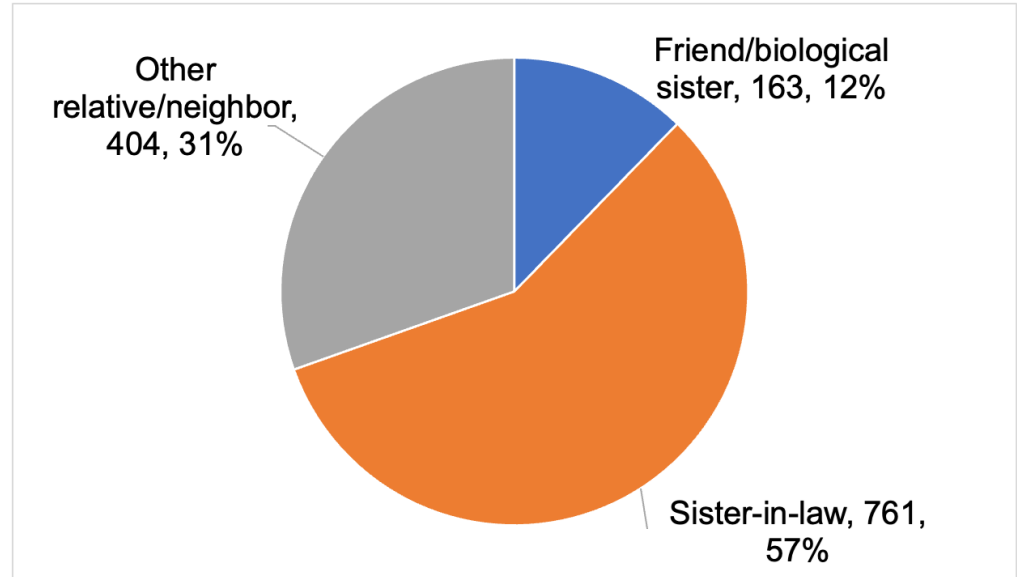
Table 1: Background characteristics (IW and CC)

	Index woman (N=1,838)	Closest confidant (N=1,328)	p-value
Age (yrs)			0.004
<20	156 (8.5)	125 (9.4)	
20-29	932 (50.8)	594 (44.8)	
>= 30	748 (40.7)	606 (45.7)	
Education			0.044
None	172 (9.4)	143 (10.8)	
Primary	571 (31.1)	370 (27.9)	
Secondary	985 (53.6)	711 (53.5)	
Tertiary	110 (6.0)	104 (7.8)	
Marital Status*			0.013
Married	1,826 (99.3%)	1,293 (98.1%)	
Widowed	9 (0.5%)	18 (1.4%)	
Divorced	3 (0.2%)	6 (0.5%)	
Living separated	0 (0.0%)	1 (0.1%)	
Parity			<0.001
0-1	171 (9.3%)	326 (24.7%)	
2	542 (29.5%)	440 (33.4%)	
3	591 (32.2%)	325 (24.7%)	
4+	534 (29.1%)	227 (17.2%)	



Results: closest confidant relationship

Most (57%) confidants were the sister in-law of the index woman, typical to the rural Bangladesh context



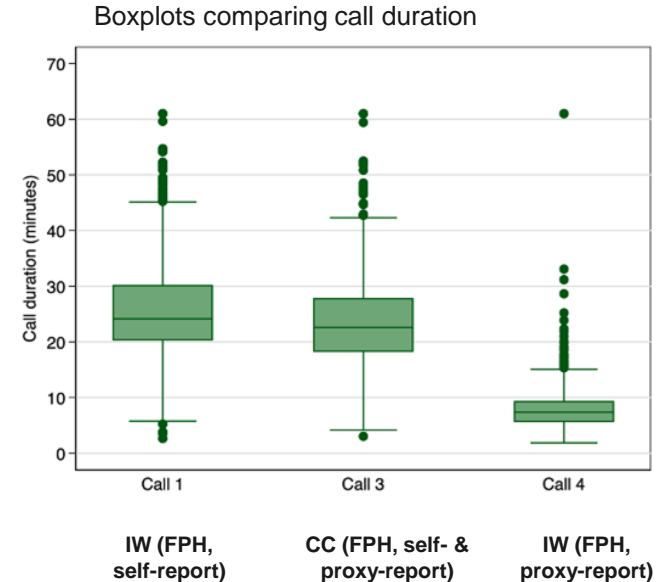
Closest confidant relation to index woman



Results: IW and CC Call Summary

Calls (1, 3, 4) Summary

Call Summary	IW (Call 1) N=1,838 IW	CC (Call 3) N=1,317 CC	IW (Call 4) N=1,286 IW
Avg. number of calls to complete interview	2.9 (2.2)	2.0 (2.1)	1.8 (1.7)
Avg. duration per complete interview (min)	25.0 (7.3)*	23.3 (7.2)*	7.5 (3.6)*
Contact Rate (phone reached/calls attempted)	73.5%	95.5%	97.9%
Refusal Rate (consent refused/women reached)	0.24%	0.15%	0.16%



Results: Limited reporting of pregnancy outcome dates

Date variables		Index women				Closest confidants			
		Self-reports (n=1,838)	%	Proxy-reports (n=1,326)	%	Self-reports (n=1,318)	%	Proxy-reports (n=1,286)	%
Total reported pregnancies		5,329		3,640		3,104		2,858	
When did pregnancy end?	Month DK*	1,567	29.4	2,602	71.5	654	21.1	2,057	72
	Year DK	1,633	30.6	2,317	63.7	928	29.9	1,835	64.2
Current age of living child?	Day DK	1,176	22.1	1,715	47.1	952	30.7	1,868	65.4
	Month DK	674	12.6	1,286	35.3	612	19.7	1,540	53.9
	Year DK	29	0.5	277	7.6	54	1.7	330	11.5
Age at death of child no longer alive	Day DK	35	0.7	59	1.6	21	0.7	32	1.1
	Month DK	16	0.3	37	1	9	0.3	22	0.8
	Year DK	3	0.1	16	0.4	2	0.1	6	0.2

High level of unreported pregnancy outcome dates:
 ~30% for self-reported PPH,
 ~70% for proxy-reported PPH

Proportions of unreported pregnancy outcome date by index women and closest confidants; *DK: don't know

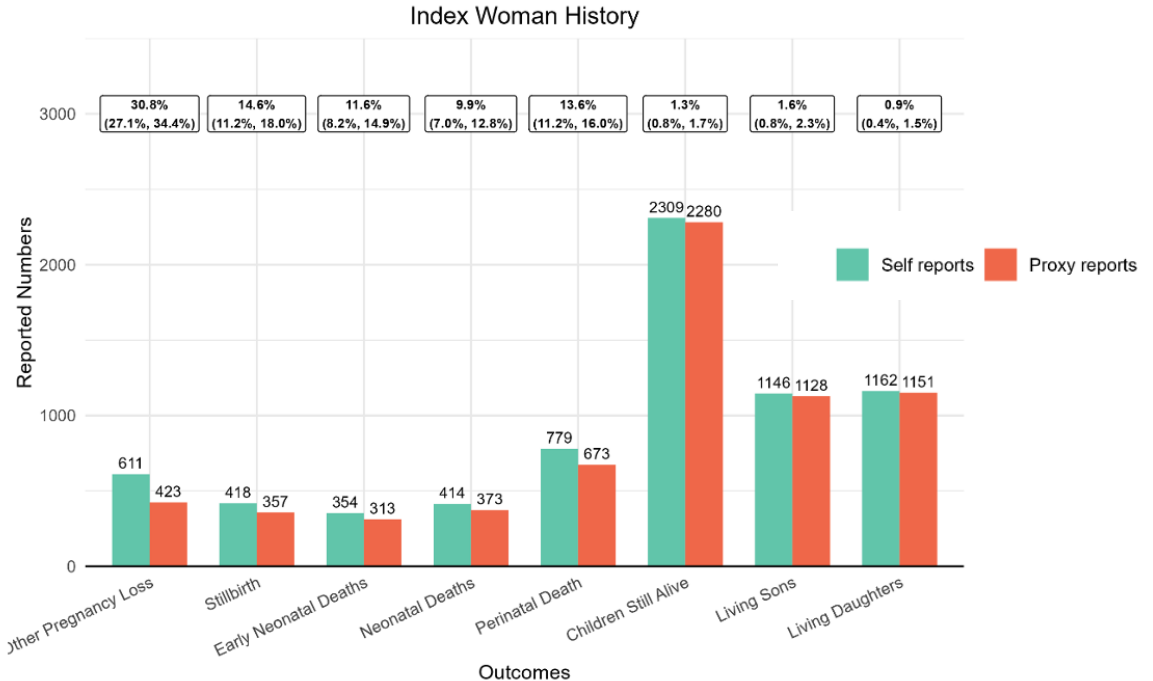


Results: reported pregnancy outcomes (index women)

Proxies under-reported **~5.9% (95 CI: 5.2-6.7%)** of all outcomes, under-reporting higher among **adverse pregnancy outcomes:**

- Children still alive underreporting: **~1.3%** (95% CI: 0.8-1.7%)
- Other pregnancy loss underreporting: **~30.8%** (95% CI: 27.1-34.4%)
- Stillbirth under-reporting: **14.6%** (95% CI: 11.2-18.0%)
- Neonatal deaths underreporting: **9.9%** (95% CI: 7.0-12.8%)
- Perinatal deaths underreporting: **13.6%** (95% CI: 11.2-16.0%)

Aggregate Comparison of index women pregnancy histories (self reported vs. proxy reported)

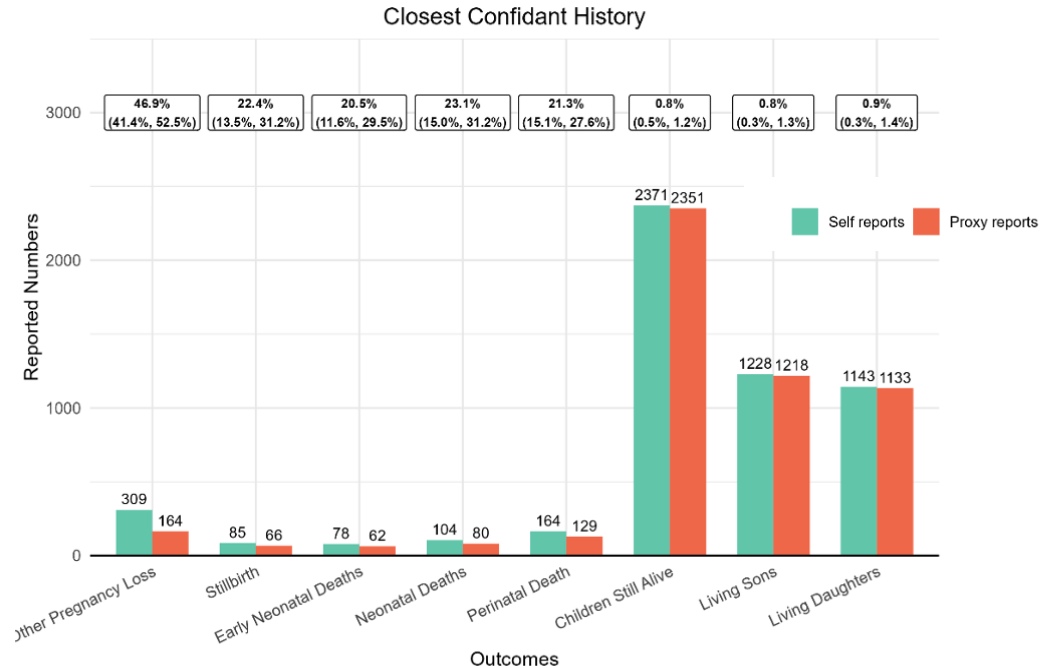


Results: reported pregnancy outcomes (closest confidant)

Proxies under-reported **~5.3% (95% CI: 4.5-6.0%)** of all outcomes, under-reporting higher among **adverse pregnancy outcomes**:

- Children still alive underreporting: **0.8%** (95% CI: 0.5-1.2%)
- Other pregnancy loss underreporting: **~46.9%** (95% CI: 41.4, 52.5%)
- Stillbirth under-reporting: **22.4%** (95% CI: 13.5, 31.2%)
- Neonatal deaths underreporting: **23.1%** (95% CI: 15.0-31.2%)
- Perinatal deaths underreporting: **21.3%** (95% CI: 15.1, 27.6%)

Aggregate Comparison of closest confidant pregnancy histories (self reported vs. proxy reported)



Results: weighted mortality rates

Mortality rate	Index women			Closest confidants		
	Self-reports	Proxy-reports	Rate ratio (proxy: self)	Self-reports	Proxy-reports	Rate ratio (proxy: self)
Neonatal mortality rate	147.0 (132.9, 161.1)	133.4 (119.9, 146.9)	0.91 (0.79, 1.04)	40.9 (33.0, 48.7)	31.6 (24.7, 38.5)	0.77 (0.58, 1.03)
Perinatal mortality	240.4 (223.5, 257.2)	213.2 (197.1, 229.4)	0.89 (0.80, 0.98)	62.4 (52.8, 71.9)	49.6 (41.0, 58.2)	0.80 (0.63, 1.00)
Early neonatal mortality rate	125.7 (112.6, 138.8)	112.0 (99.6, 124.4)	0.89 (0.76, 1.04)	30.7 (23.9, 37.5)	24.5 (18.4, 30.6)	0.80 (0.57, 1.11)
Stillbirth rate	129.3 (116.9, 141.6)	113.2 (101.5, 125.0)	0.88 (0.76, 1.01)	32.3 (25.5, 39.2)	25.4 (19.3, 31.5)	0.79 (0.57, 1.08)
Other pregnancy loss rate	156.2 (143.8, 168.5)	114.9 (104.0, 125.9)	0.74 (0.65, 0.83)	101.5 (90.2, 112.9)	56.9 (48.2, 65.6)	0.56 (0.46, 0.68)

Calculated mortality rate ratios are largely **consistent** with the extent of **under-reporting** presented in slides 13-14.

Rate ratios of perinatal mortality (IW FPH) and other pregnancy loss rate (IW & CC FPH) were significantly under-reported compared to self-reported FPH.

Perinatal mortality rates based on self and proxy reports and rate ratios of proxy- vs self-reports among index women and closest confidants*



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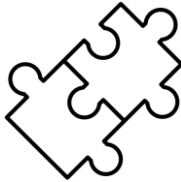
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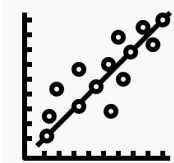
Methods: matching individual pregnancy outcomes



Matched individual pregnancy outcomes between self- and proxy-reported outcomes through an automated and manual matching process (matched by mother's ID, parity, pregnancy number, age of living child, age at death, gender, vital status).



Assessed the concordance of self- and proxy- reported pregnancy outcomes for index women (IW) and closest confidants (CC) using 2x2 misclassification tables.



Conducted multivariable regression models to evaluate potential variables associated with misclassification.



Key Findings: pregnancy outcomes misclassification (IW)

Difference in concordance rates by pregnancy outcome (IW & CC)

	IW FPH			CC FPH		
	Concordance (N, %)	Discordance (N, %)	p-value	Concordance (N, %)	Discordance (N, %)	p-value
Overall concordance	3,080 (92.5)	240 (7.5)		2,511 (96.7)	78 (3.0)	
Child still alive	2,153 (97.5)	56 (2.5)	<0.001	2,237 (98.9)	26 (1.1)	<0.001
Lost before birth	270 (85.4)	46 (14.6)		107 (85.6)	18 (14.4)	
Stillbirth	302 (83.7)	59 (16.3)		61 (81.3)	14 (18.7)	
Neonatal deaths ≤ 28 days	310 (85.2)	54 (14.8)		60 (79.0)	16 (21.0)	
Death > 28 days	72 (91.1)	7 (8.9)		46 (92.0)	4 (8.0)	

- **Overall concordance:** 92.5% (IW), 96.7% (CC);
- **Overall discordance:** 7.5% (IW), 3.0% (CC)
- **Highest discordance observed** for neonatal deaths ≤ 28 days for both IW and CC



Key Findings: pregnancy outcomes misclassification (IW)

Table 2a: Logistic regression table for discordance of pregnancy outcomes (IW)

		Unadjusted OR (95 CI)	Adjusted OR (95 CI)
Age	<20	Ref	Ref
	20-29	1.28 (0.72, 2.28)	1.85 (0.50, 6.81)
	>= 30	1.29 (0.73, 2.28)	1.96 (0.54, 7.11)
Education	None	Ref	Ref
	Primary	1.16 (0.72, 1.86)	0.60 (0.24, 1.50)
	Secondary	0.94 (0.60, 1.49)	0.82 (0.35, 1.94)
	Tertiary	0.87 (0.45, 1.69)	0.40 (0.08, 2.07)
Confidant relation	Sister-in-law	Ref	Ref
	Friend/Biological Sister	0.78 (0.46, 1.32)	0.73 (0.21, 0.57)
	Other relative/neighbor	1.39 (1.04, 1.86)	1.24 (0.73, 2.12)
Index women (self) reported parity		1.41 (1.28, 1.55)	1.61 (1.32, 1.96)
Self-reported pregnancy outcome	Child still alive	Ref	Ref
	Lost before birth	6.55 (4.35, 9.87)	13.49 (7.08, 25.67)
	Stillbirth	7.51 (5.11, 11.04)	15.71 (7.60, 32.47)
	Died after birth	6.14 (4.20, 8.97)	7.48 (3.69, 15.19)

- Probability of misclassification **higher among adverse pregnancy outcomes** (lost before birth, still birth, died after birth) compared to child still alive status



Discussion: key takeaways



Mobile phone based proxy full pregnancy history surveys are a feasible and valid way to estimate perinatal mortality
- Underestimates perinatal mortality compared to self-reports.



Despite strong alignment in reported pregnancy outcomes, particularly for children who are still alive, significant challenges persist in recalling the dates of these outcomes.

Substantial proportion of women cannot recall year or month of pregnancy outcome, Potentially lack of physical calendar tools during phone interviews and generally low socioeconomic status (SES) / educational attainment



Higher parity associated with higher probability of misclassification of pregnancy outcomes



Thank you

Questions?