

Maternal and Neonatal Health

Opportunities and Challenges for mHealth in resource-limited settings

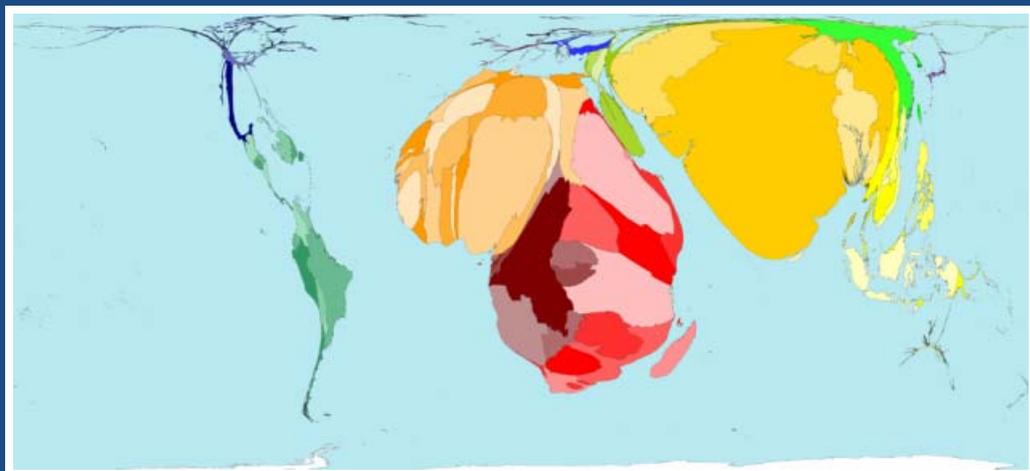
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mHealth Research Group

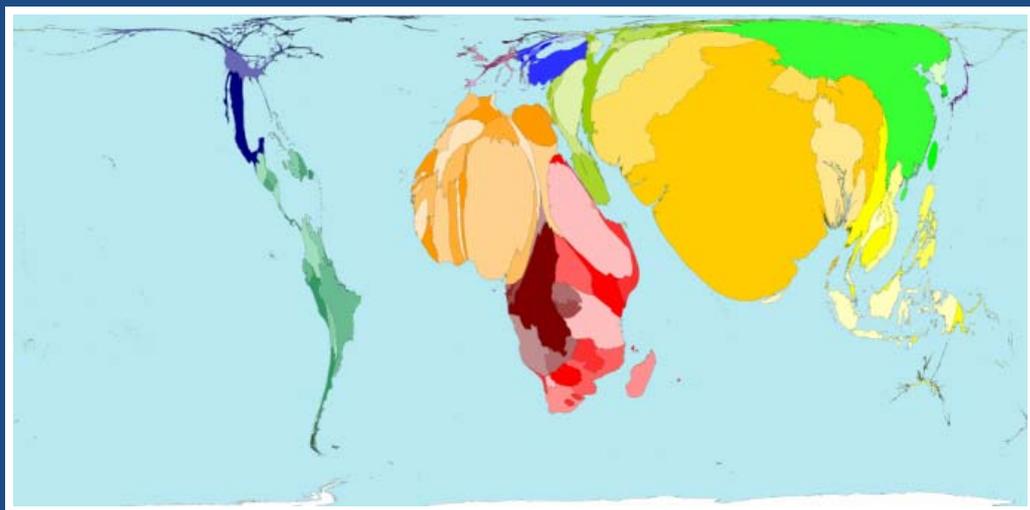
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Program in Global Disease Epidemiology and Control
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Baltimore, Maryland (USA)



MDG 4/5 – Defining the burden



Global Burden of Maternal Mortality



Global Burden of Neonatal Mortality



When do maternal deaths occur?

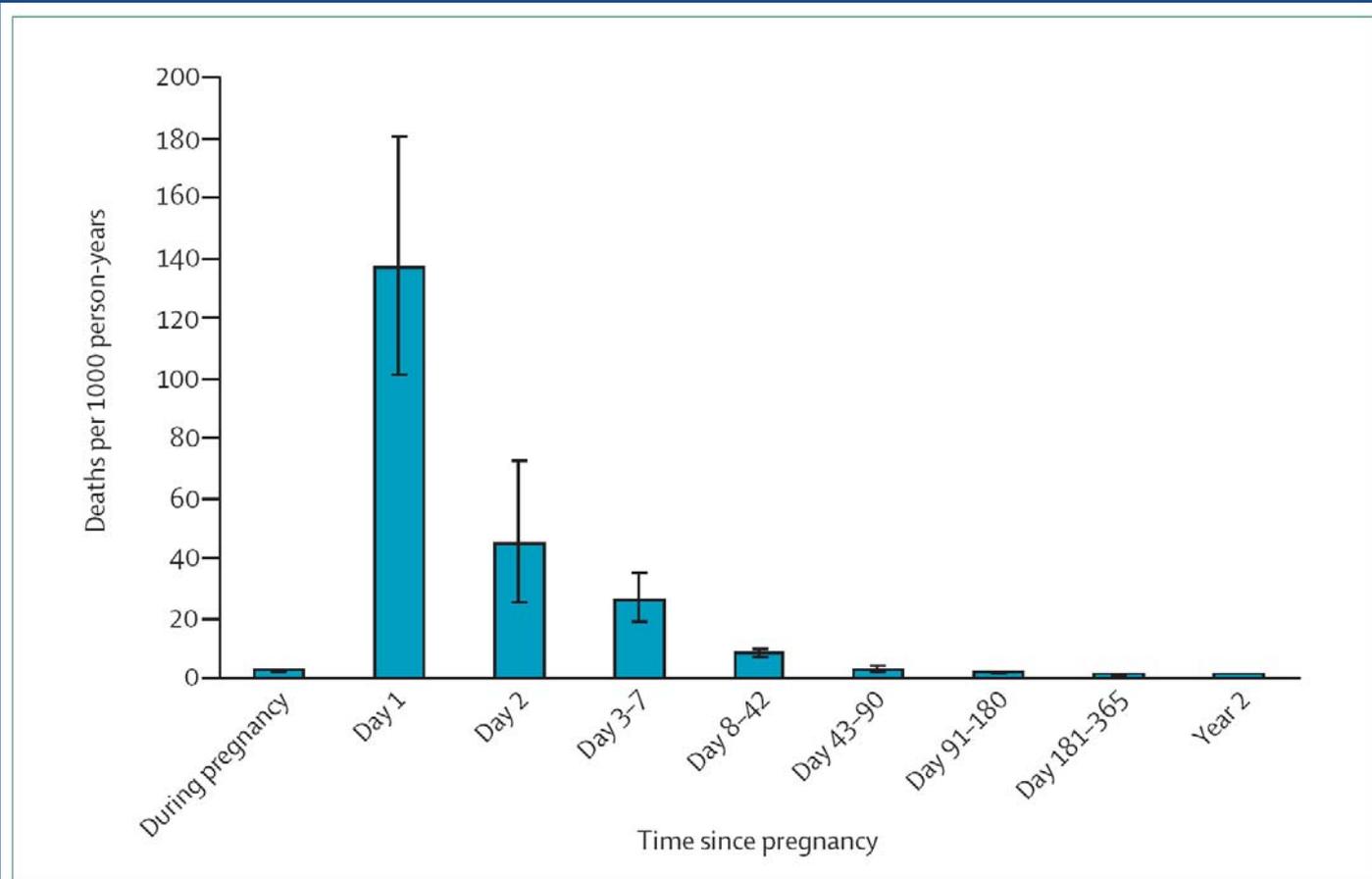
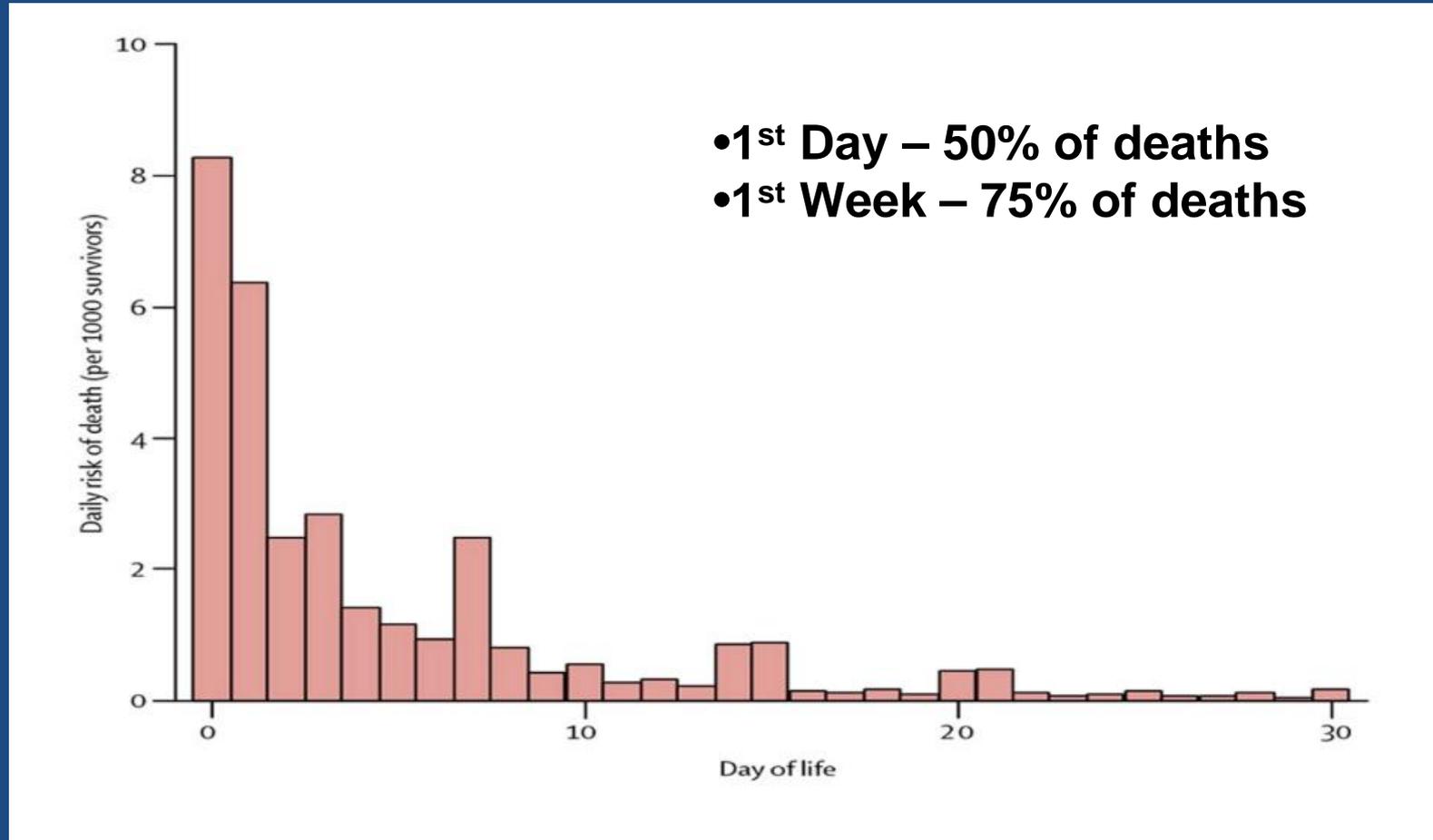


Figure 4: Mortality during pregnancy and by time since end of pregnancy in Matlab, Bangladesh

Data from reference 3. Black lines show 95% CI.



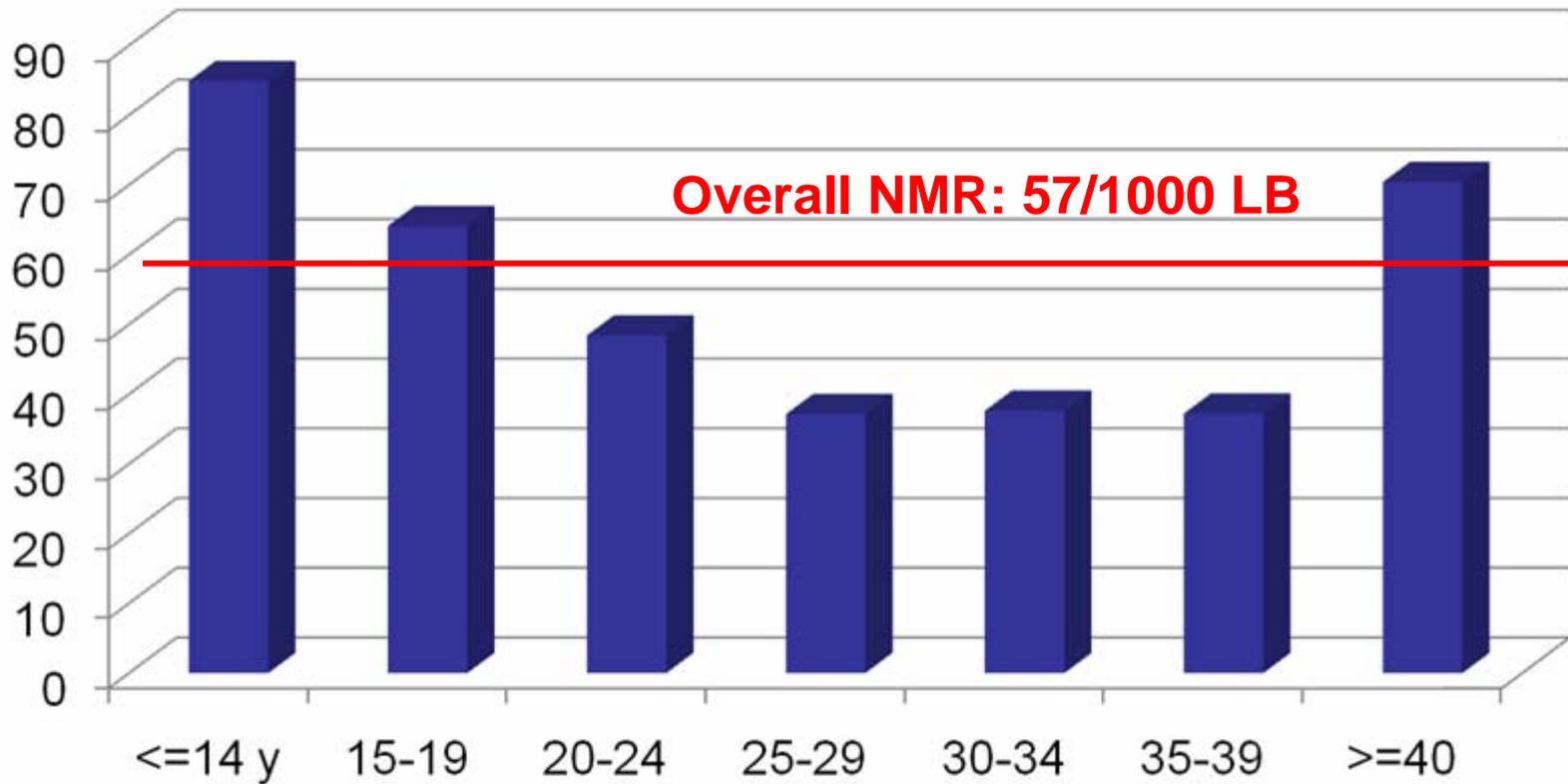
When do neonatal deaths occur?





Neonatal Mortality by Maternal Age at Pregnancy ($n=12,023$ live births)

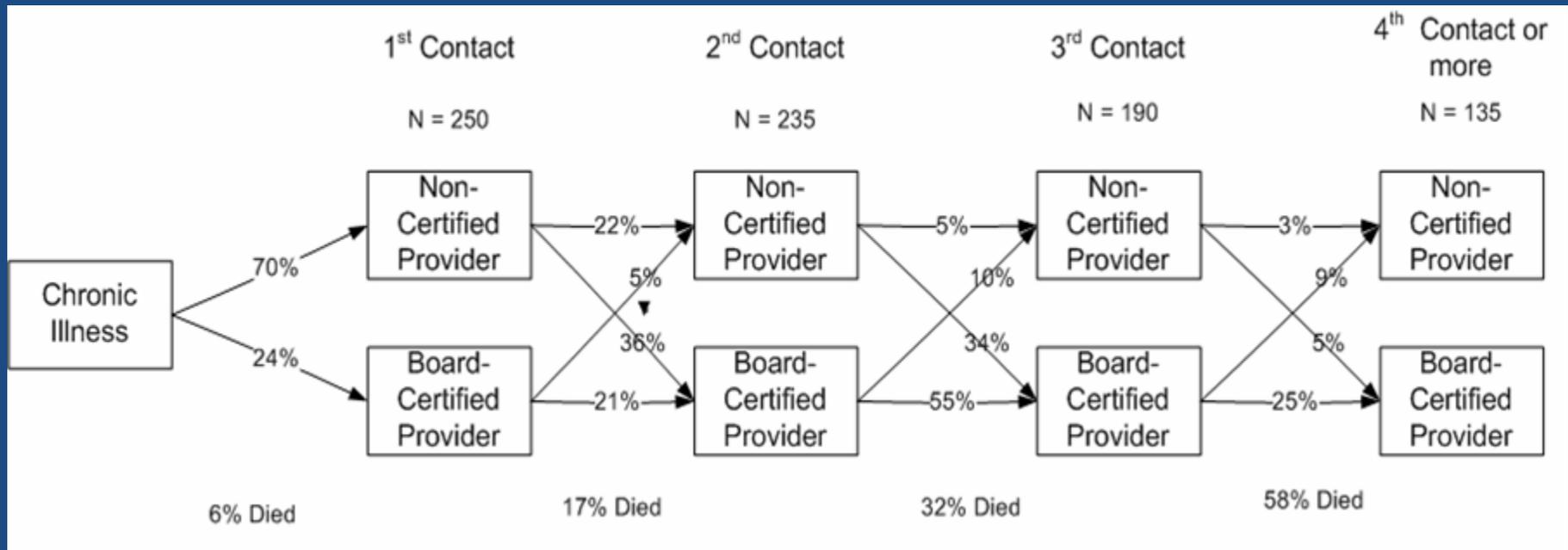
NMR (Deaths per 1000 Live Births)



Maternal Age



Complex pathways to mortality...



Sikder et al., 2010, M/S in preparation



Unskilled first-line responders

A 20-year-old woman who experienced obstructed labor explained:

“ When I tried to give birth, the umbilical cord came out first. The dai who was helping me called 2 other trained dais. They were afraid to touch me because they said they had never seen anything like this before. Two hours later, my family called an ambulance, but the baby was already dead, probably from the cord being wrapped around its neck for a long time. ”

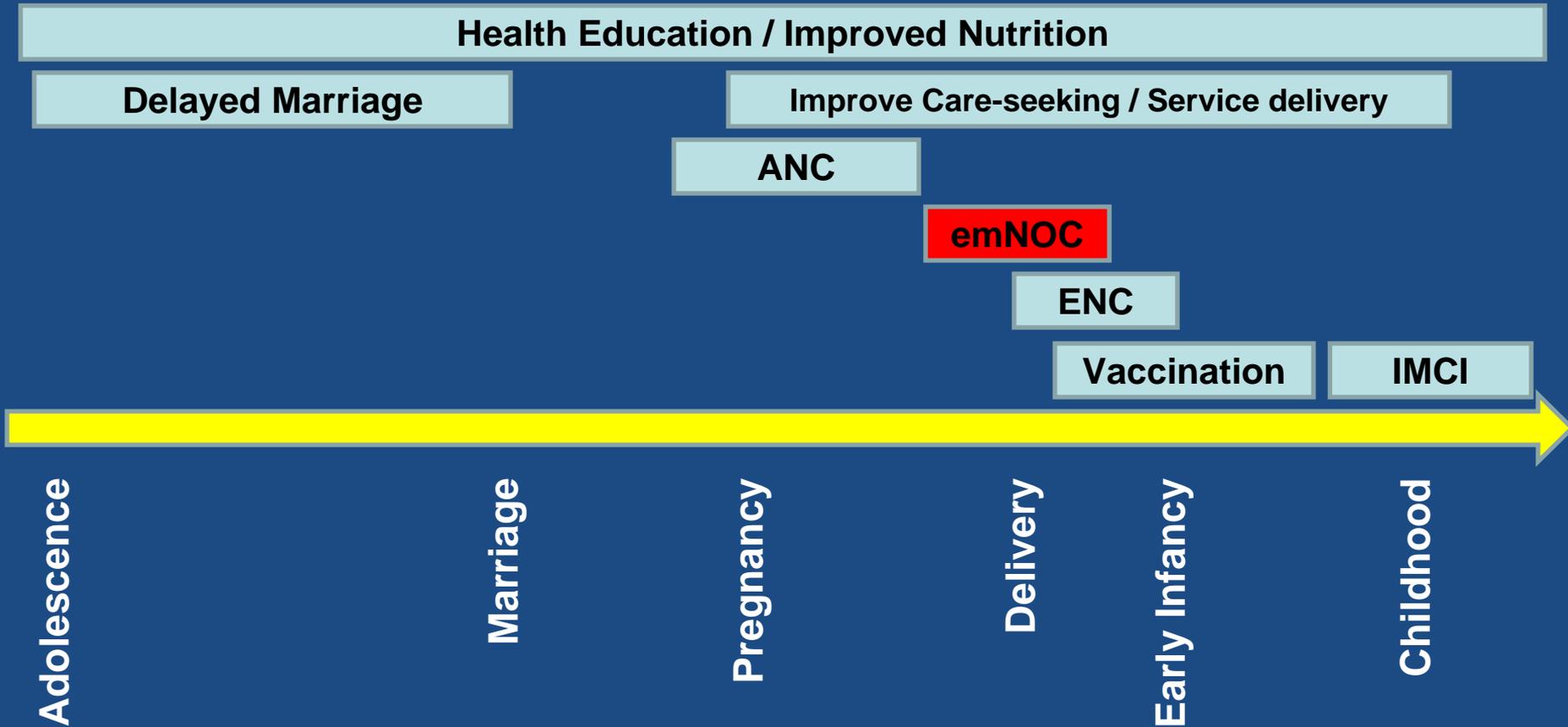


Compounded Delays...

“During the home delivery, the child’s head became stuck. An untrained *dai* used her fingers to pull the child’s head to deliver the baby. The placenta would not come out even after much pulling. The woman had so much bleeding that it flowed over the floor. The family hurriedly took her to the government hospital, where attendants inserted their hands ... to remove the placenta. The bleeding stopped immediately. The woman became very weak, and doctors were unable to get saline to enter her body. They suggested the woman be transferred to the district hospital. Before the family was able to arrange transportation, the woman died.”



A Continuum of Opportunity





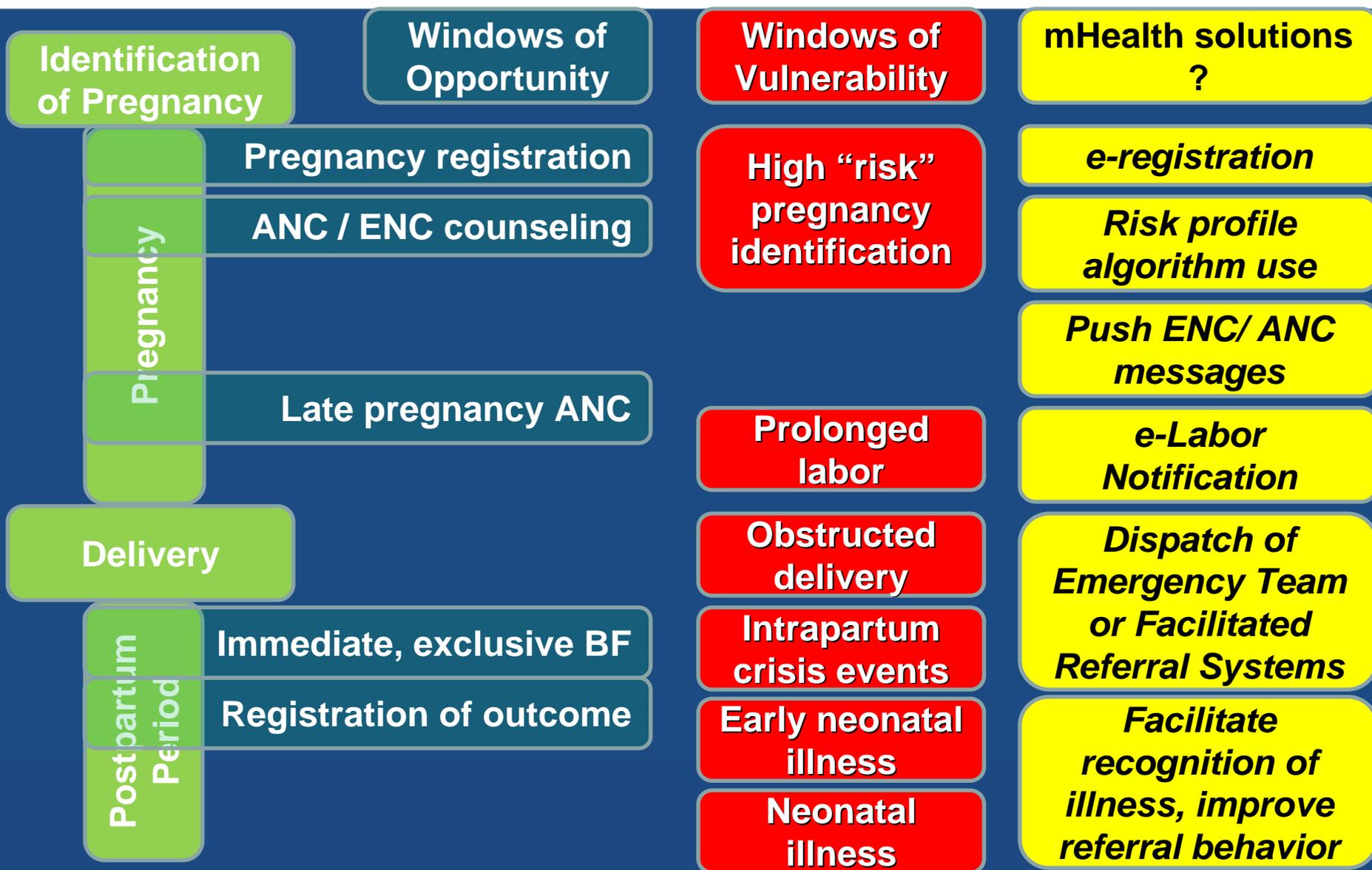
“Simple” Strategies

- **Increase access to information**
 - Improve decision-making
- **Improve routine preventive care**
 - ANC
 - ENC
- **Compress the time between crisis and care**
 - Expedite appropriate decisions
 - Accelerate treatment-seeking
 - Accelerate care provision



mHealth “Opportunities” in MNCH

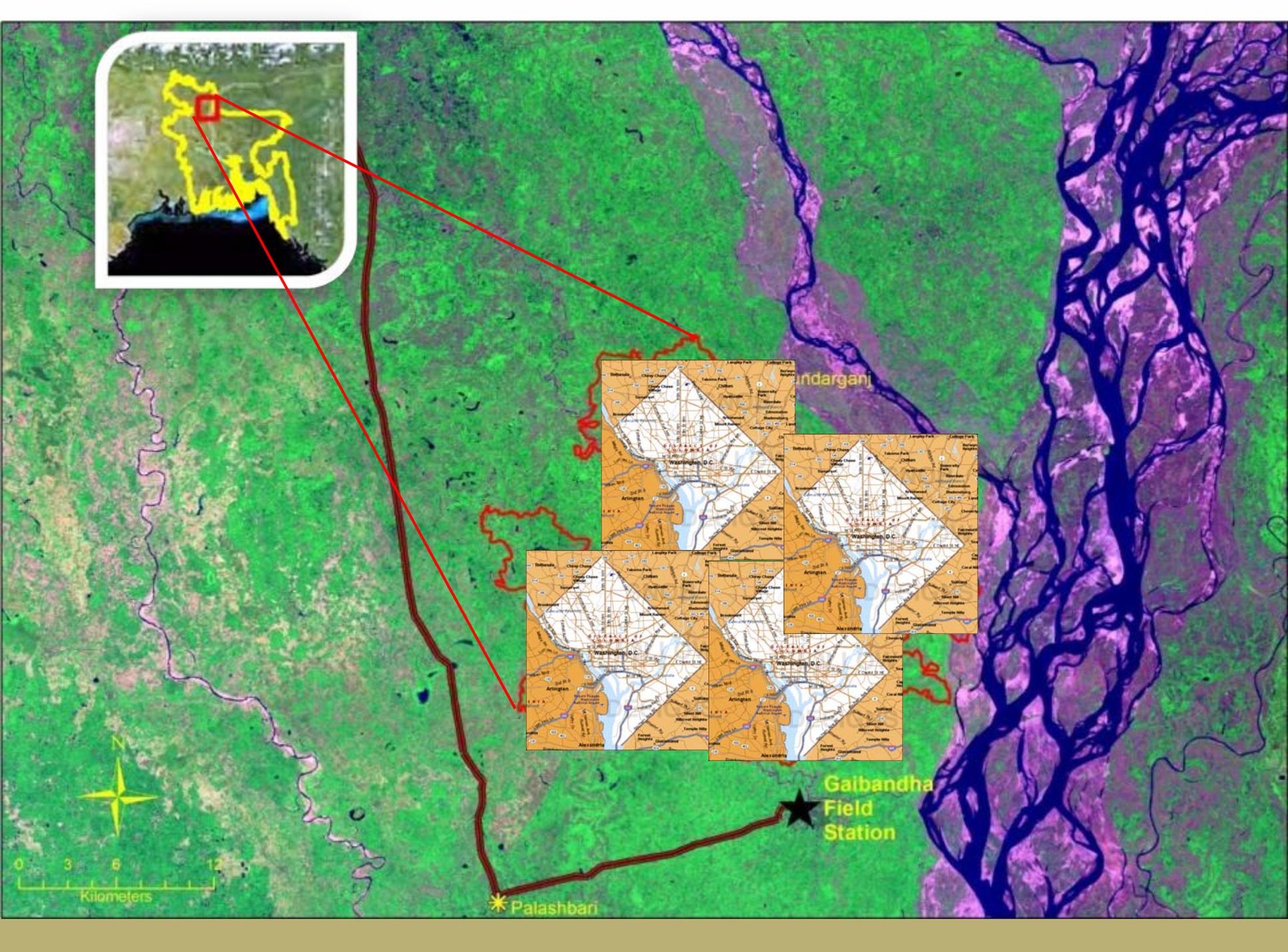
Immediate access to information → rapid, targeted response





**Example: The Johns Hopkins “JiVitA”
Maternal and Child Health Research Site (www.jivita.org)**





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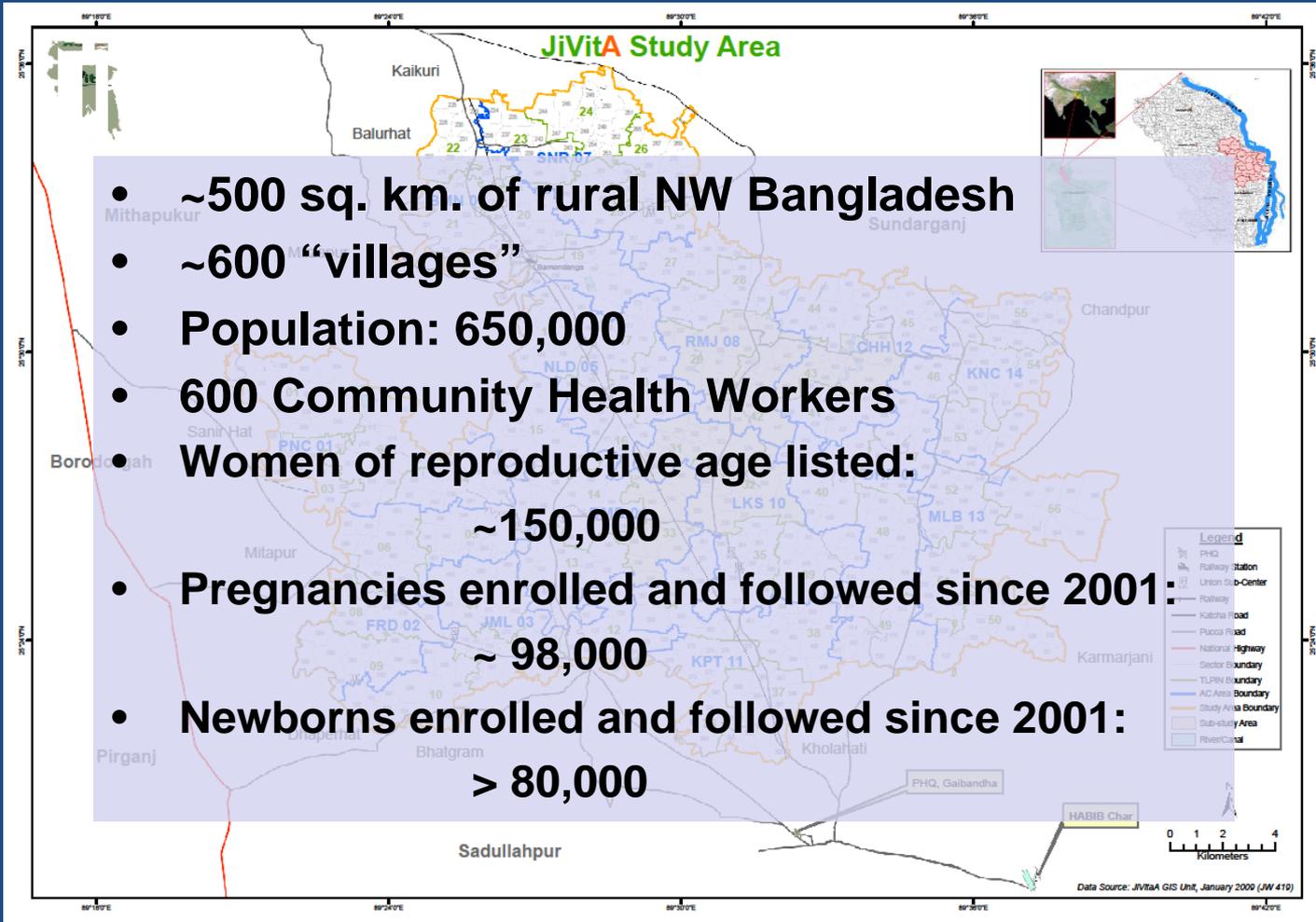
Gaibandha
Field
Station

* Palashbari

0 3 6 12
Kilometers



The Johns Hopkins “JiVitA” Maternal and Child Health Research Site





Enrolled mothers are periodically interviewed for diet, morbidity, other exposures, pregnancy outcomes, and infant health





Pregnancies are monitored weekly, and vital events reporting is ongoing using paper and digital systems.





Field-based study workers, on bicycles, reach newborns within 18 hrs of birth.



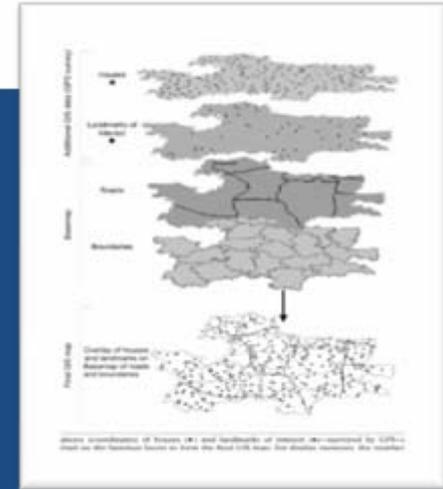


Data Entry, Processing and Management





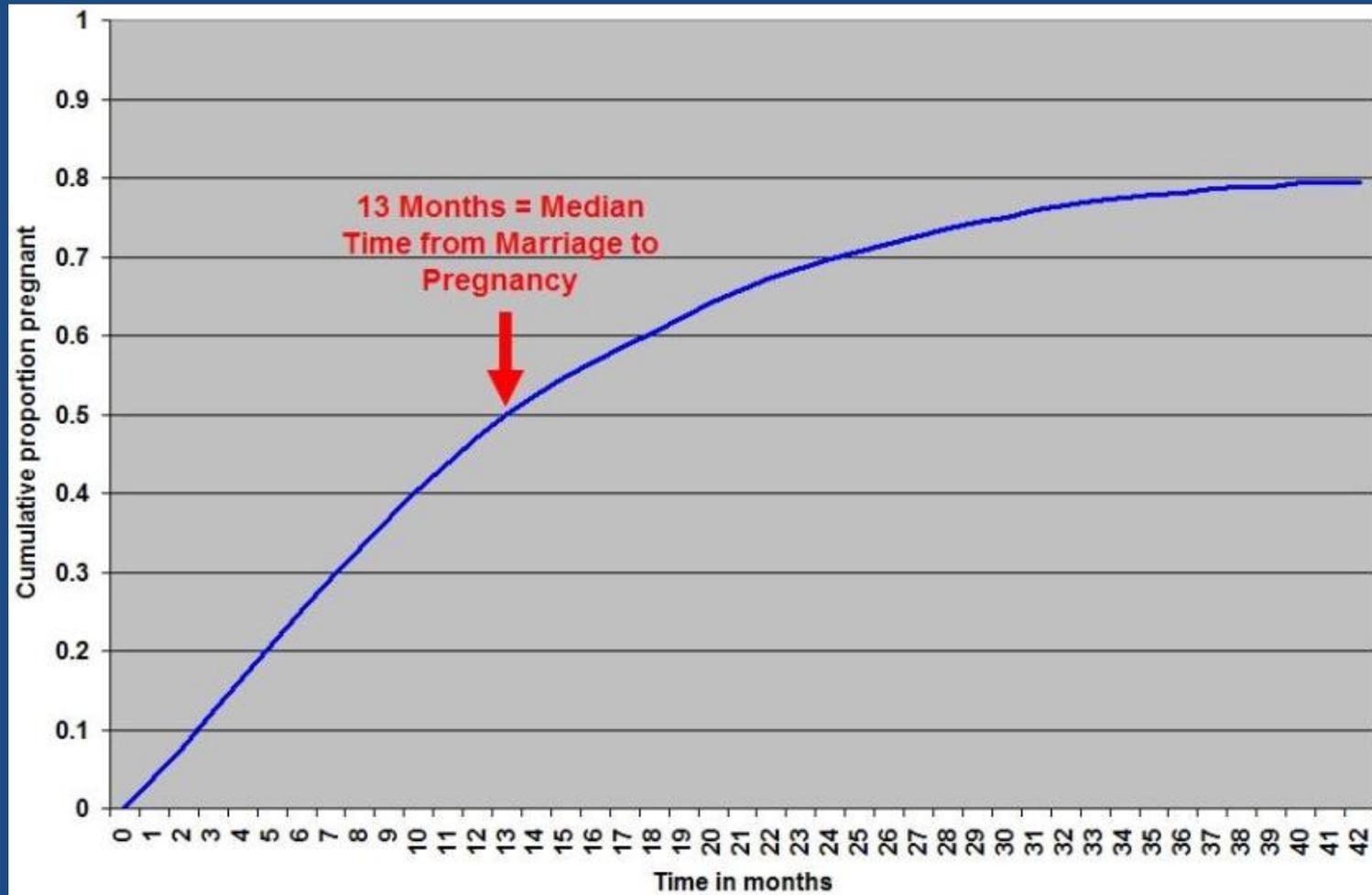
Over 260,000 homes are GIS-mapped...



- Over 260,000 GPS Points
- Households updated
- Rural road network
- Health Center locations
- “Distance” to facility capable

Girls are married, on average, at age 16½

“Survival Curve” of Time to Pregnancy after Marriage
(Among Cohort of Newly Married Women 2001-2005)



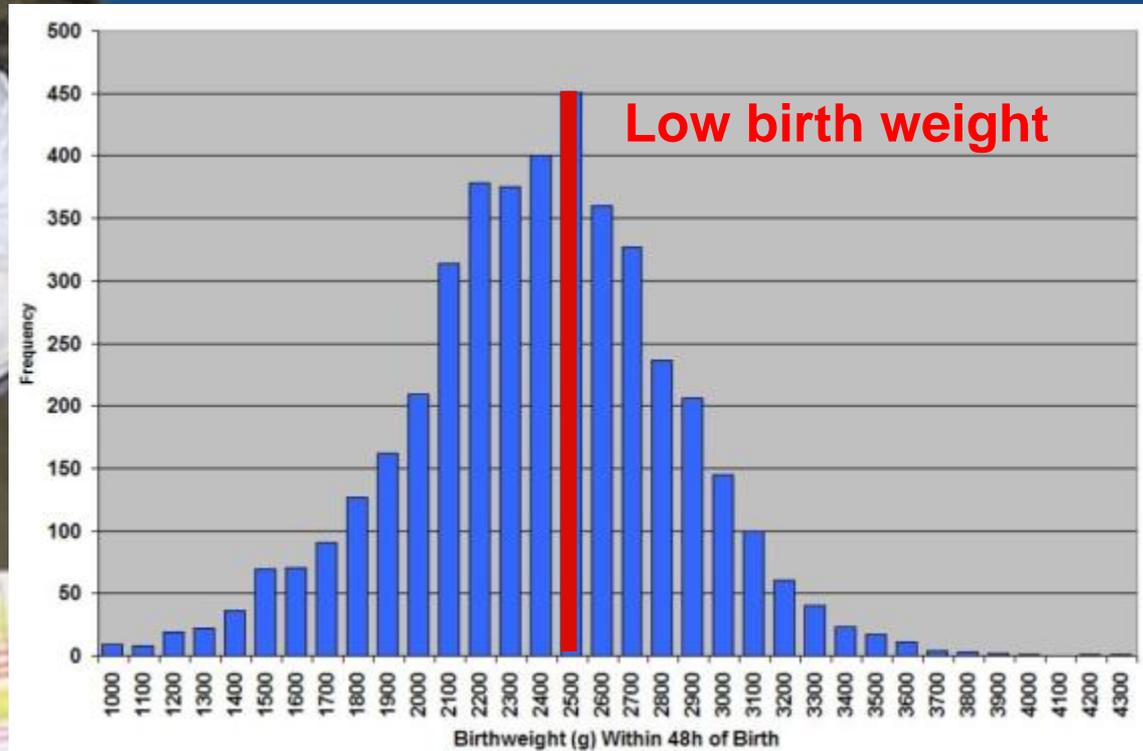
Source: Labrique, JiVitA Data (*Unpublished*)



~50% of infants are low birth weight

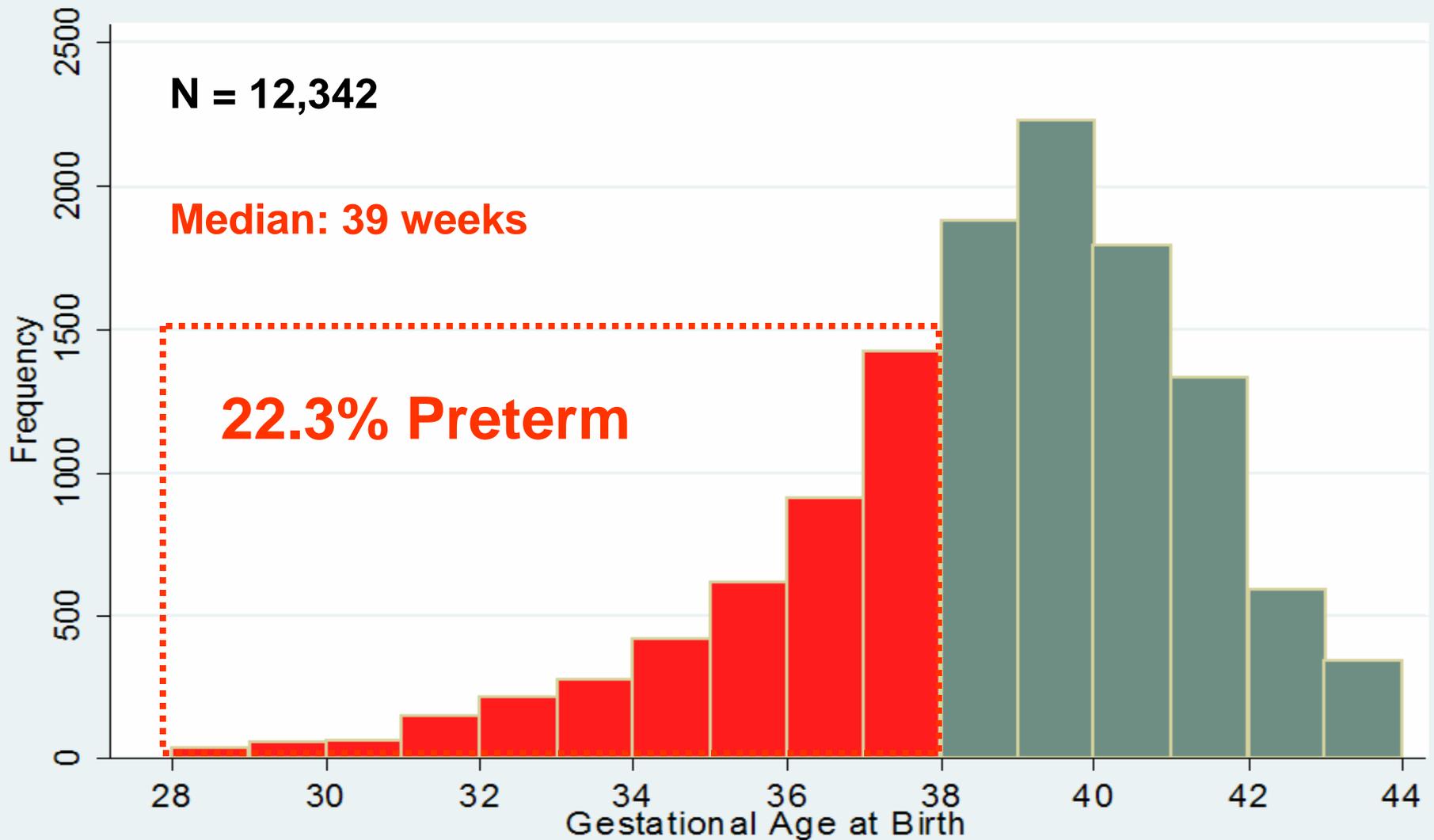
N=12,342 Newborns

Mean wt= 2442 grams



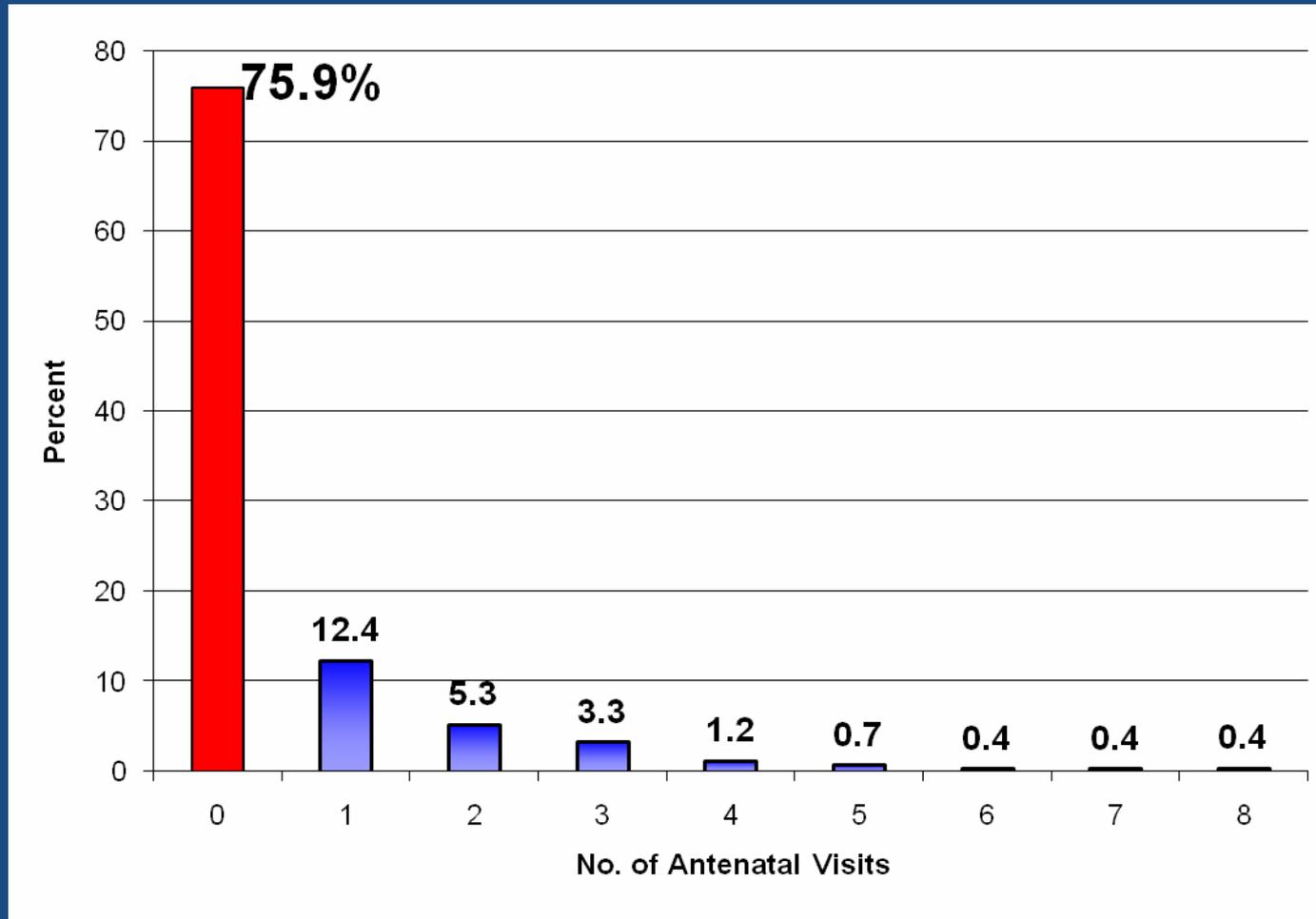


~ 22% of neonates are preterm...





Most pregnant women in this population experienced NO routine antenatal care (2001-2007, n=41,285)





Mobiles ?



Source: © Photographersdirect.com

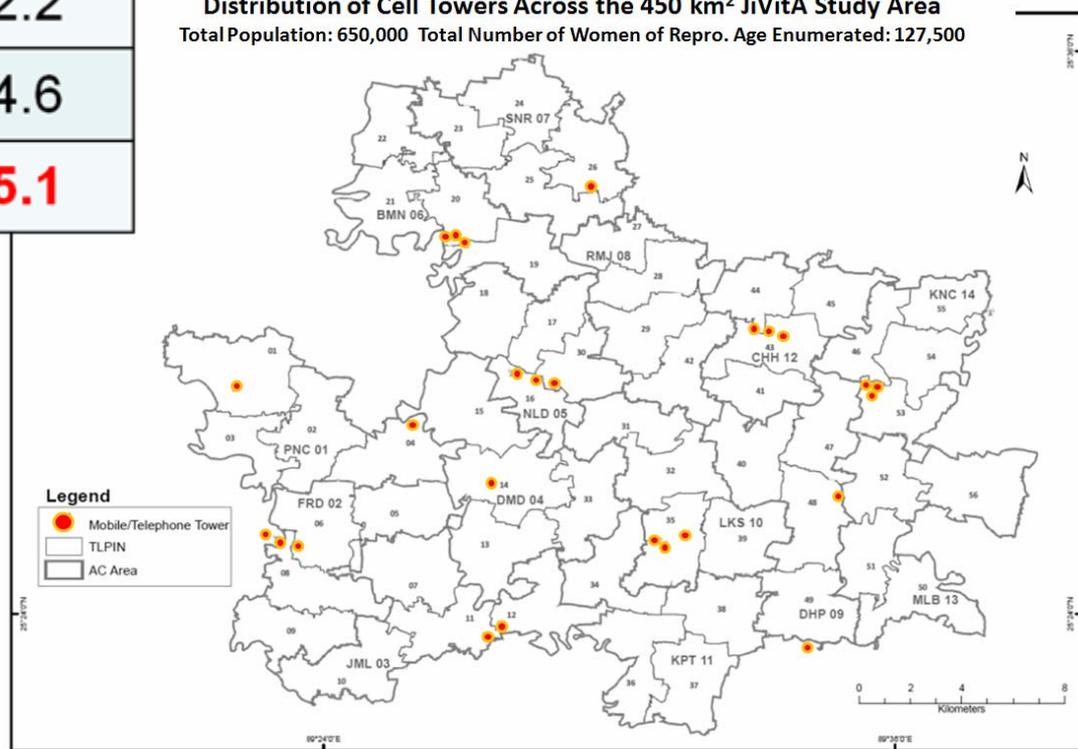
Cellular Coverage and Household Ownership seems High

N=32,528 (2007-2010)

Year	Frequency	%
2007	37 / 181	20.4
2008	3,996 / 18,016	22.2
2009	4,600 / 13,293	34.6
2010	3977 / 8,826	45.1

- 3G / EVDO networks
- High bandwidth capacity
- Wide network of traditional market phone support and charging systems

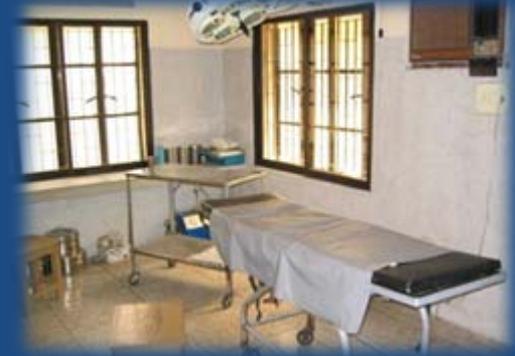
Distribution of Cell Towers Across the 450 km² JiVitA Study Area
Total Population: 650,000 Total Number of Women of Repro. Age Enumerated: 127,500



Source: Labrique, JiVitA Data (*Unpublished*)



Families who have phones use them during pregnancy Crises N=11,451 (2007-2010)



Number of “Near Miss” events	611 (5%)
Mobile phone use during crisis	337 (55%)



<i>Mobile phone used to call provider</i>	241 (72%)
<i>Mobile phone used for medical advice</i>	193 (57%)
<i>Mobile phone used to arrange transport</i>	110 (33%)
<i>Mobile phone used to ask for financial aid</i>	70 (21%)



Some examples...

- A 23-year-old woman who experienced obstructed labor:

“When the traditional birth attendants realized they could not handle the delivery, they phoned the family welfare assistant for advice. She told us to go straight to the government hospital, where I received an emergency C-section that saved me.”

- A 17-year-old girl who experienced postpartum hemorrhage:

“After delivery, I lost so much blood that the village doctor could not make it stop. He used his mobile phone to call an ambulance to immediately take me to the maternal and child welfare center.”



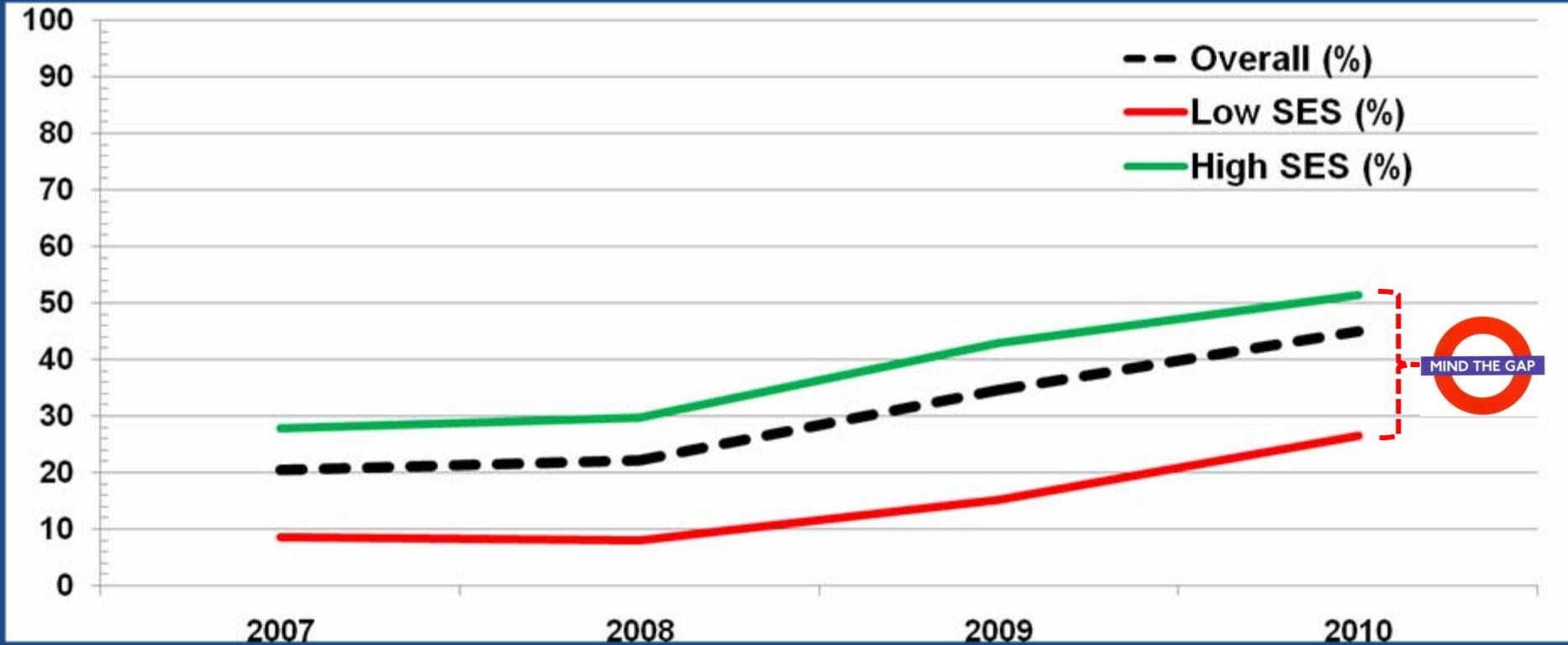
What about the gap ?





Phone Ownership – Associations with SES

N=32,528 (2007-2010)



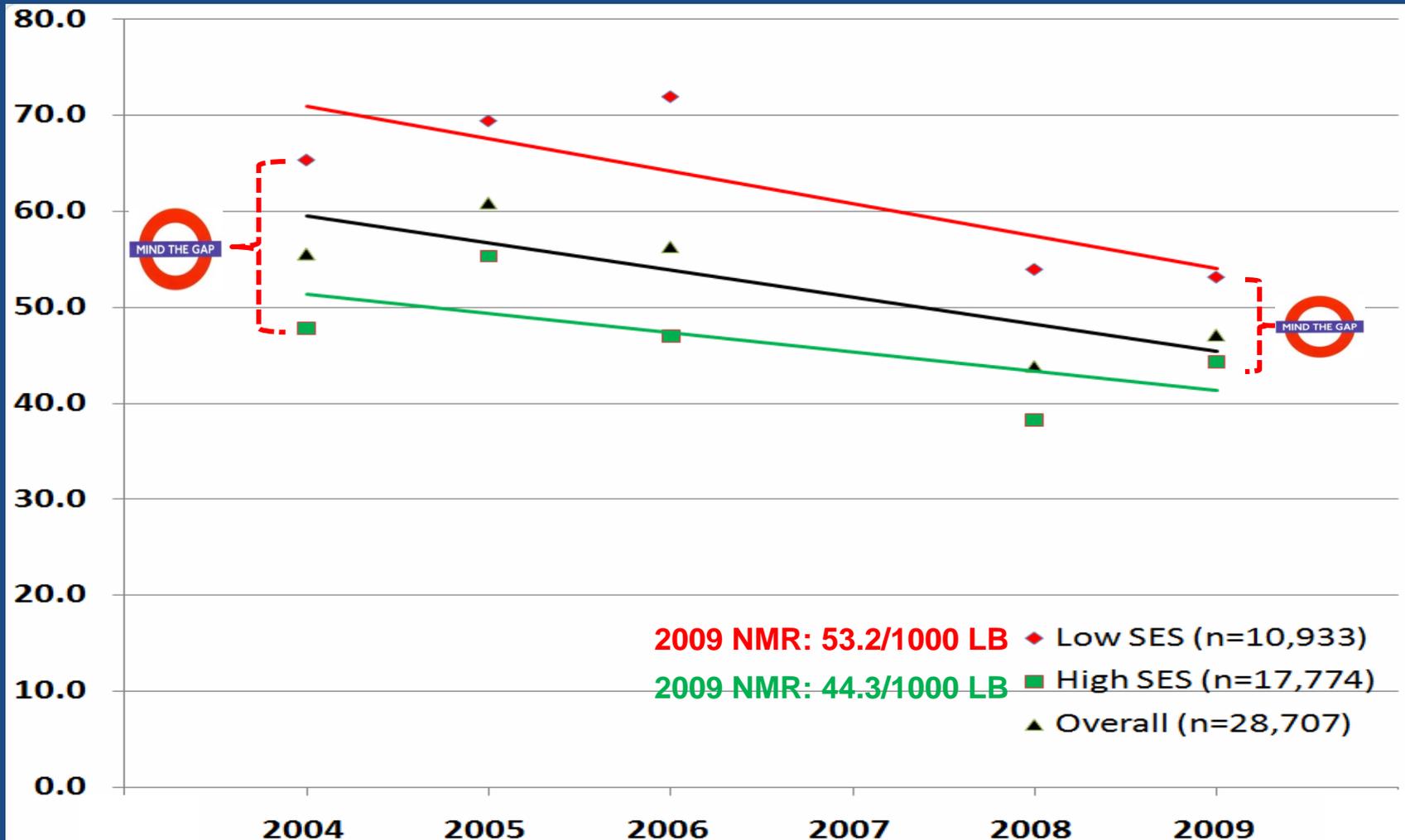
	Overall (%)	Low SES (%)	High SES (%)
2007	20.4	8.6	27.9
2008	22.2	8.0	29.7
2009	34.6	15.2	42.9
2010	45.1	26.6	51.4

*SES proxied by household construction index.

Source: Labrique, JiVitA Data (*Unpublished*)



Neonatal Mortality – Associations with Socioeconomic Status

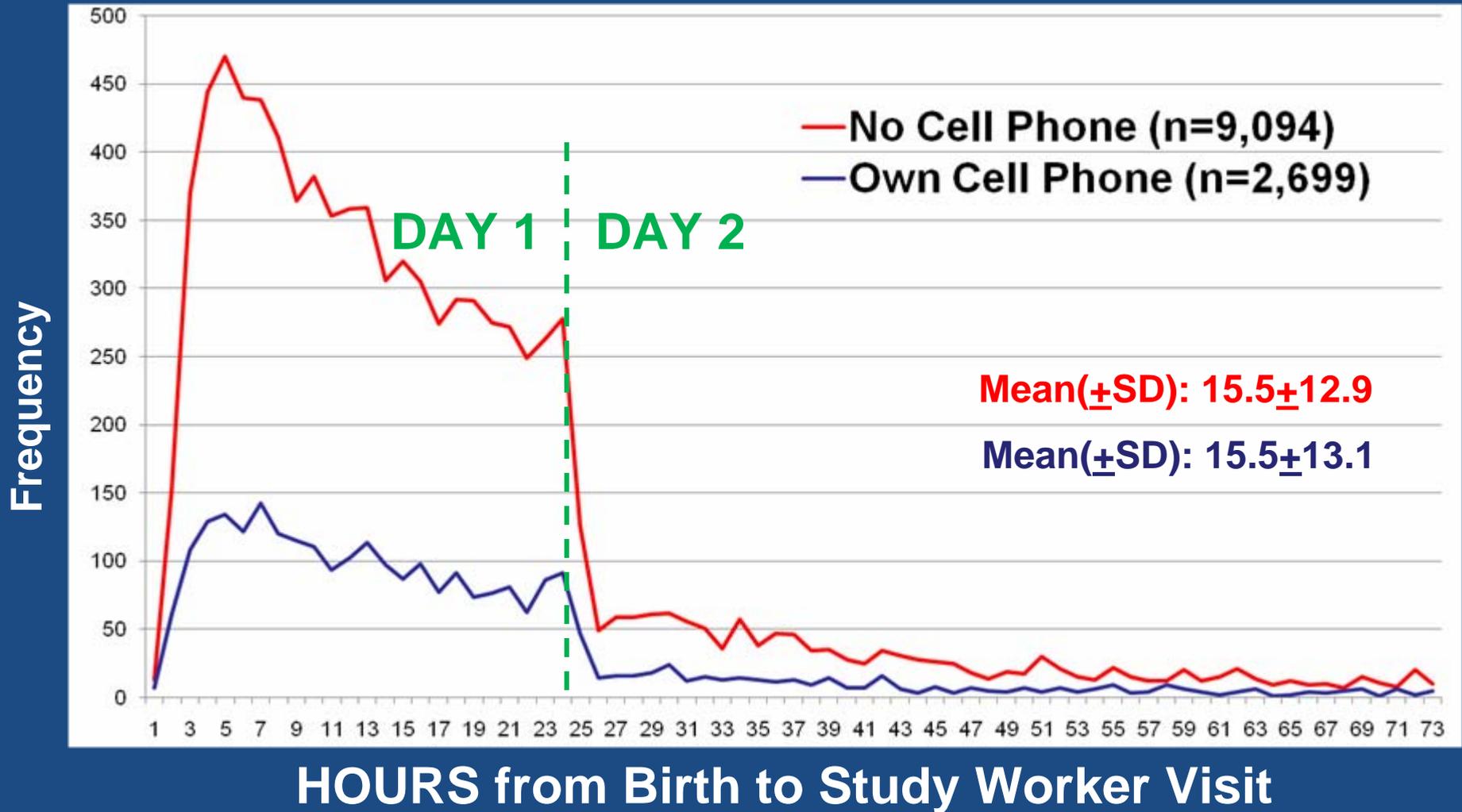


*SES proxied by household construction index.

Source: Labrique, JiVitA Data (*Unpublished*)



Average Birth Notification Speed did not differ by Family Phone Ownership (2007-2010)





So...





Potential Priorities

Test mHealth for what “we know works”:

- Antenatal and Infant Vaccines
- Improve safe / clean deliveries
- Emergency, facilitated referrals
- Provide essential newborn care
- Assure postpartum mother / newborn visit
- Improve immediate / exclusive breastfeeding
- Generate robust data streams (vital registries)



Potential Priorities

- **Leverage mHealth / ICT opportunities to:**
 - Track / monitor progress of pregnant women
 - Immediately notify / record births
 - Immediately recognize pre-term births
 - Provide location information to CHW / Provider
 - Standardize delivery of ENC/EOC
 - Automate algorithms for classifying severely ill newborns



Moving Forward...

- **Common “mHealth” vocabulary**
- **Defined research agenda**
 - Testing ideas
 - Demonstrating feasibility
 - Establishing cost-effectiveness
 - **Measuring EFFICACY**
- **Defining mHealth “Success”**
 - Standardized, defined process indicators
 - Standardized, defined outcome indicators



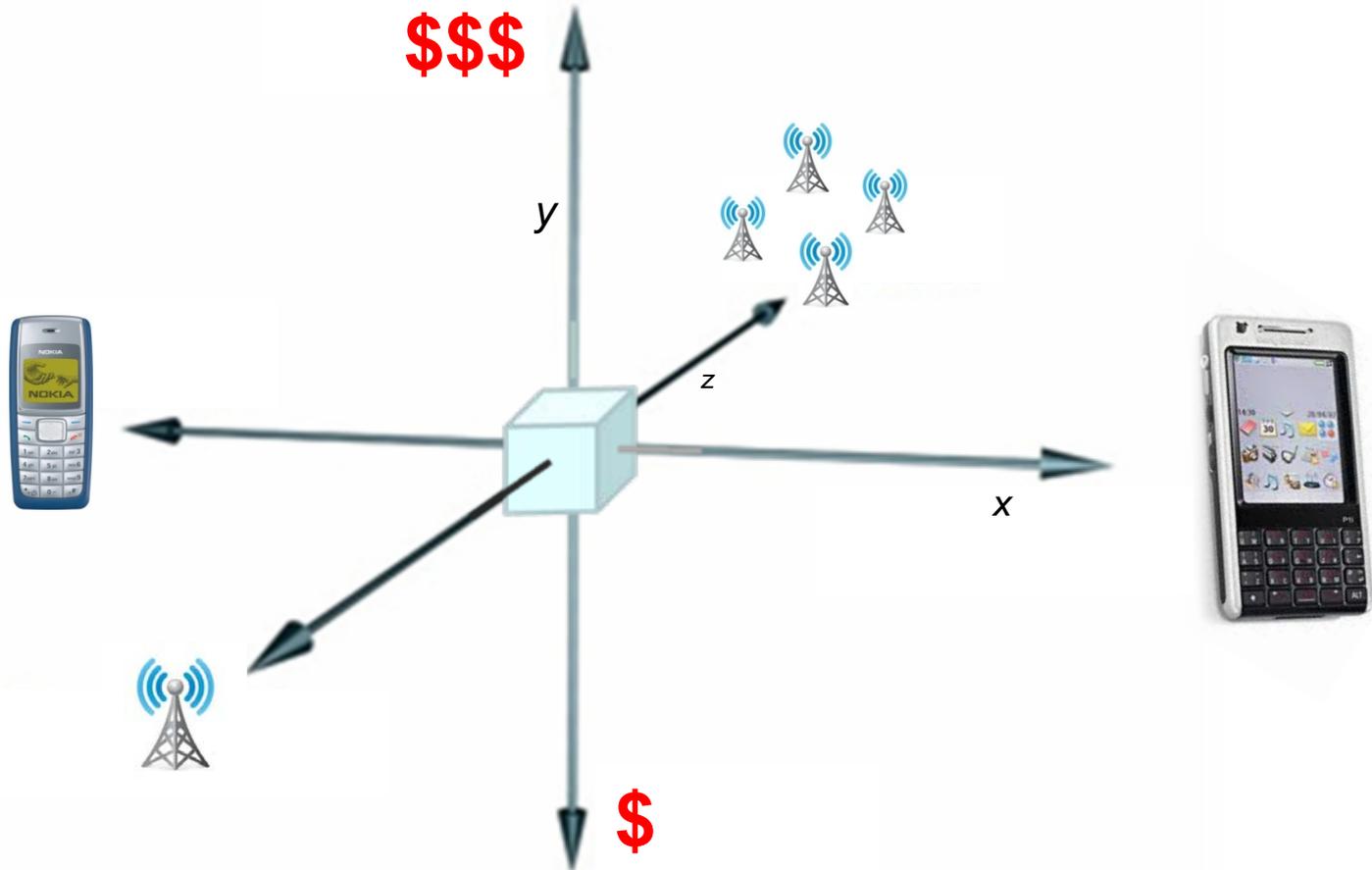
How to prioritize ?



Identify, test and advocate for interventions that:

- Have measured public health impact
- Are cost-effective and sustainable
- Are locally appropriate and scalable
- Target MDG / MNCH Priorities
- Strengthen health systems

Selecting mHealth Strategies for MNCH: What is the target “space” ?



Other axes: health system infrastructure, burden of disease / mortality, etc...



Summary

- Continuum of opportunity
- Bridge the “Gap” between Problems and Solutions
- Develop and use robust measures of impact
- *Future thoughts: Protection of patient confidentiality*



Thank you অনেক ধন্যবাদ

