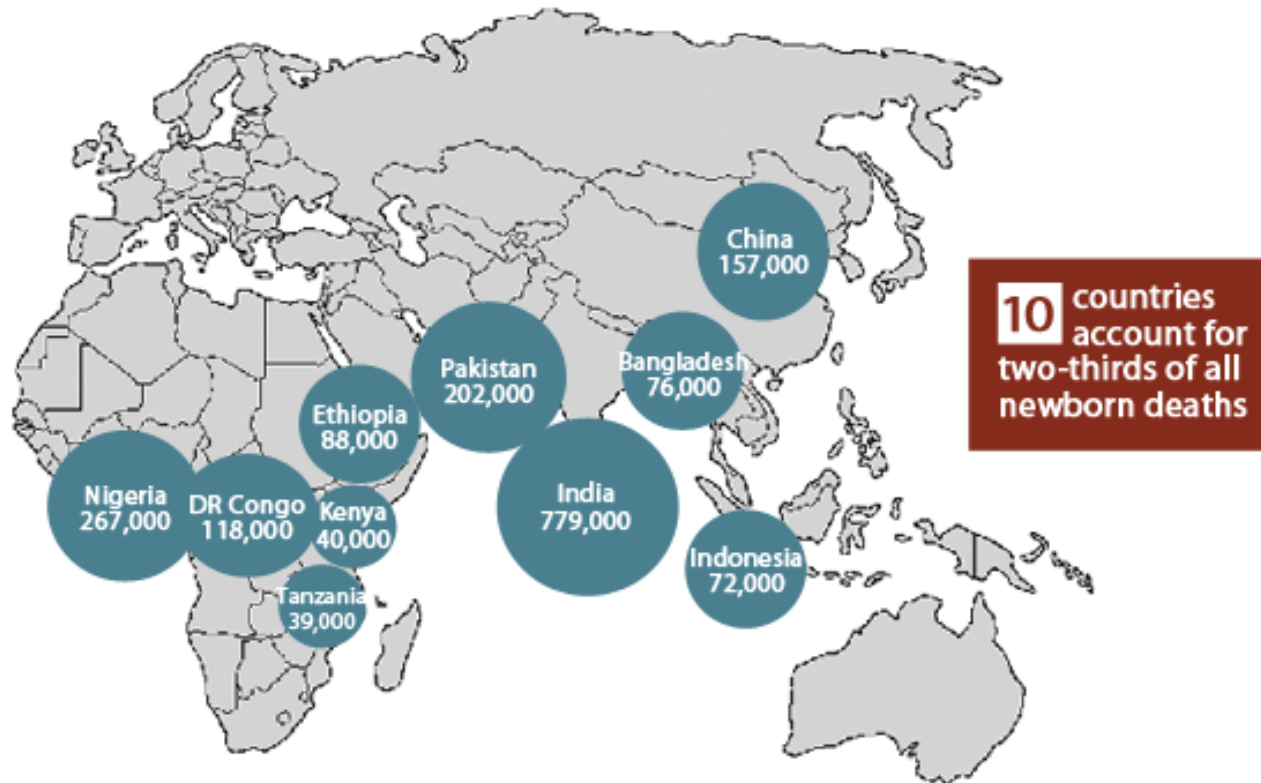# Mobile Tools for Health Workers Targeting Neonatal Health in Low-Resource Settings

Maria Freytsis CNM, MPH
December 12th, 2013

10 Countries with highest annual Neonatal Mortality

China
157,000

10 countries account for two-thirds of all newborn deaths

Pakistan
202,000

Bangladesh
76,000

Ethiopia
88,000

Nigeria
267,000

DR Congo
118,000

Kenya
40,000

India
779,000

Indonesia
72,000

Tanzania
39,000

Source: UNICEF, WHO, The World Bank, UNFPA. 2013. Levels and Trends in Child Mortality, report 2013.
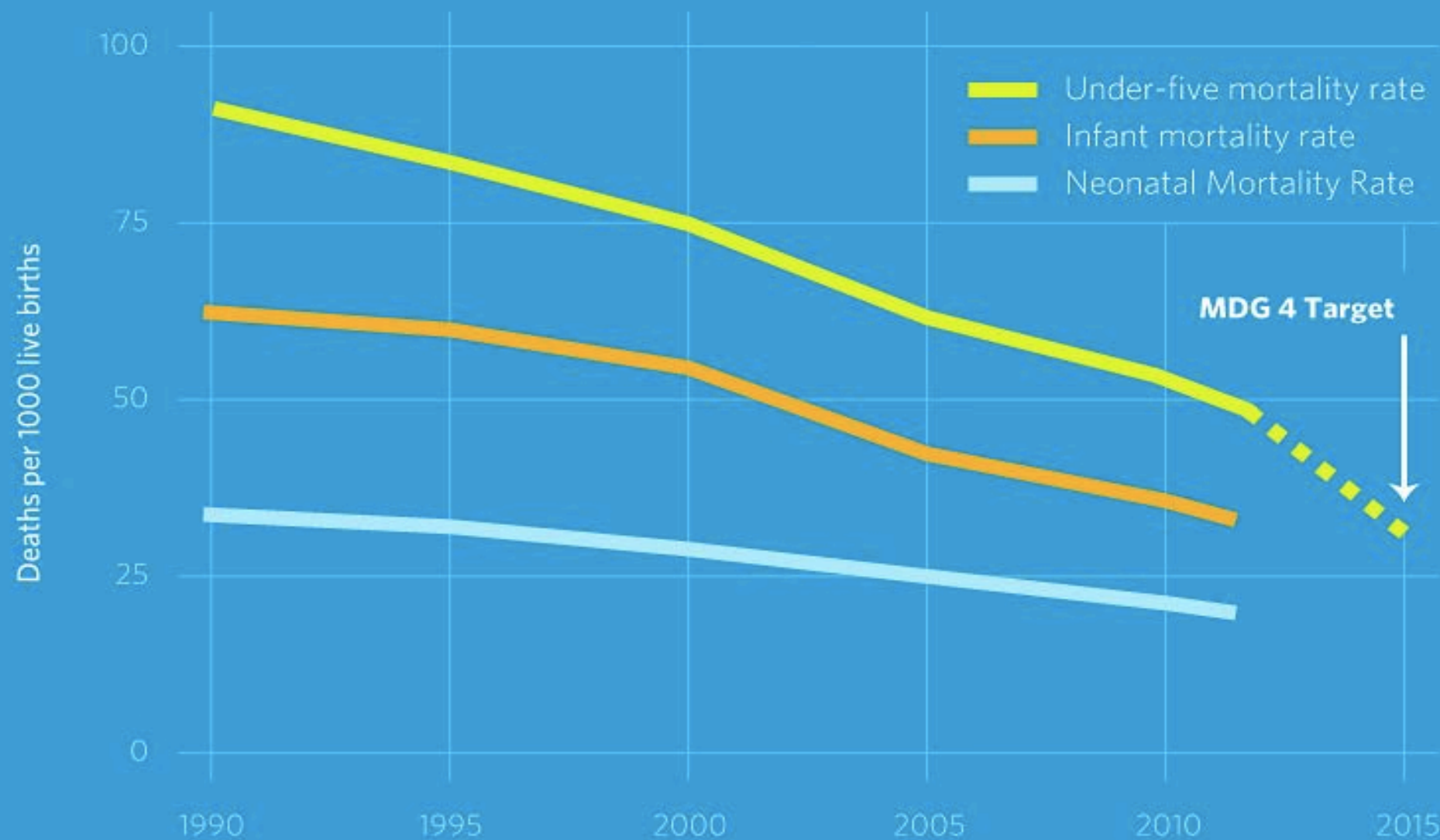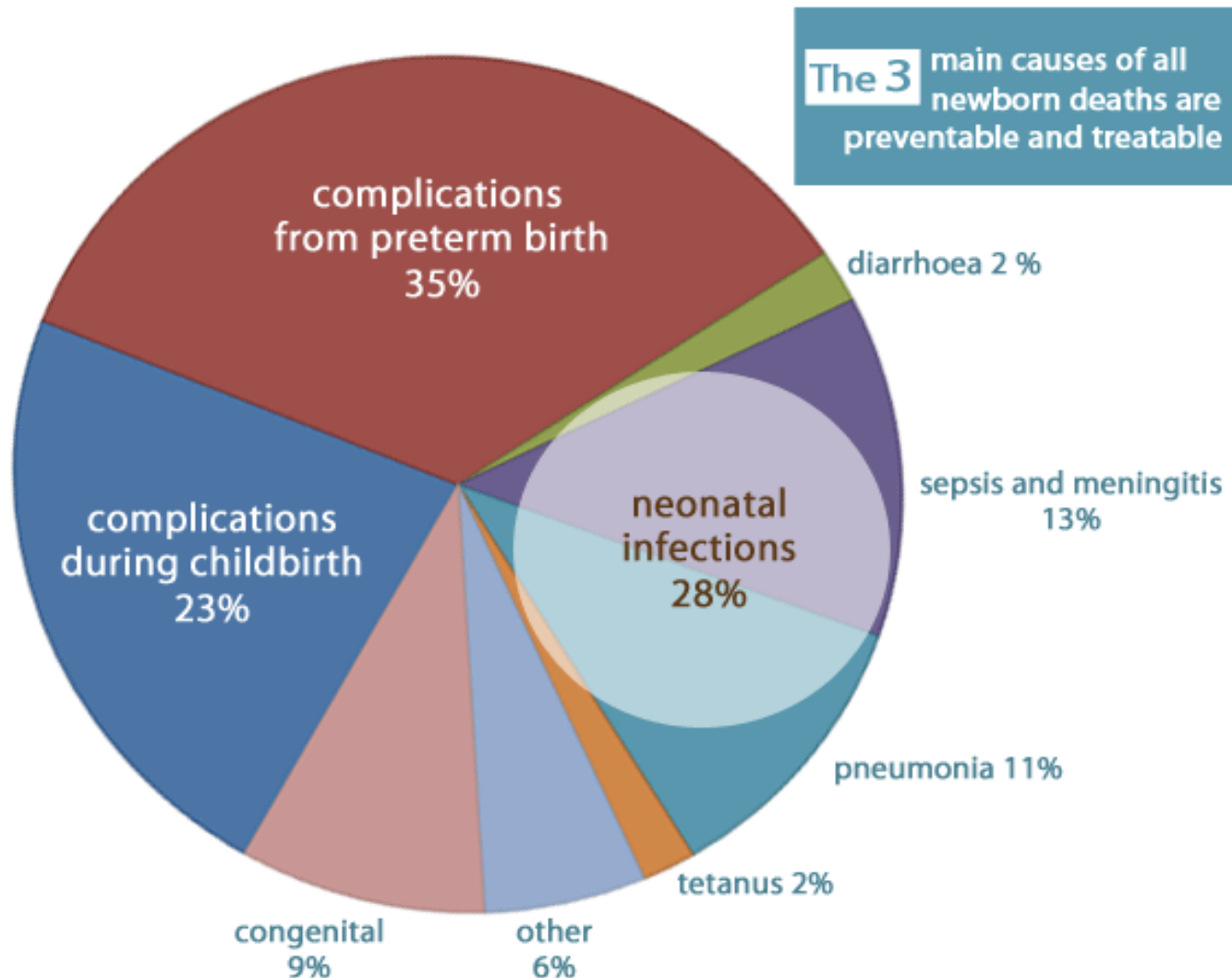
GLOBAL UNDER-FIVE MORTALITY RATES

FIGURE 1: This graph represents global under-five, infant and neonatal mortality rates between the years 1990 and 2012. The rate has almost halved since 1990 but we still have work to do.

Legend:
- Under-five mortality rate
- Infant mortality rate
- Neonatal Mortality Rate

MDG 4 Target

Y-axis: Deaths per 1000 live births (0, 25, 50, 75, 100)

X-axis: 1990, 1995, 2000, 2005, 2010, 2015

Global Causes of Newborn Deaths

The **3** main causes of all newborn deaths are preventable and treatable

complications from preterm birth 35%

diarrhoea 2 %

sepsis and meningitis 13%

complications during childbirth 23%

neonatal infections 28%

pneumonia 11%

tetanus 2%

congenital 9%

other 6%

Majority of neonatal deaths occur in the first week of life and, of those, the majority take place in the first 24 hours

Liu L, Johnson HL, Cousens S, et al. Global, regional, and national causes of child mortality: an updated systematic analysis for 2010 with time trends since 2000. *Lancet.* Jun 9 2012;379(9832):2151-2161.

Of the estimated 3.6 million newborns that die every year in the first 4 weeks of life, 1.4 million stillbirths and 1.5 million neonatal deaths are attributable to maternal health complications

Bhutta ZA, Lassi ZS, Blanc A, Donnay F. Linkages among reproductive health, maternal health, and perinatal outcomes. *Seminars in perinatology.* Dec 2010;34(6):434-445.

# Maternal interventions with demonstrated impact on neonatal mortality

- Birth spacing
- Prevention of indoor air pollution
- Prevention of intimate partner violence
- Antenatal care
- Doppler ultrasound monitoring during pregnancy
- Insecticide-treated mosquito nets
- Birth and newborn care via community-based intervention packages
- Emergency obstetric care
- Elective induction for post-term pregnancy
- Cesarean delivery for breech presentation
- Prophylactic corticosteroids in preterm labor
- Early initiation of breastfeeding

Bhutta ZA, Lassi ZS, Blanc A, Donnay F. Linkages among reproductive health, maternal health, and perinatal outcomes. *Seminars in perinatology.* Dec 2010;34(6):434-445.

Coverage of Key Interventions
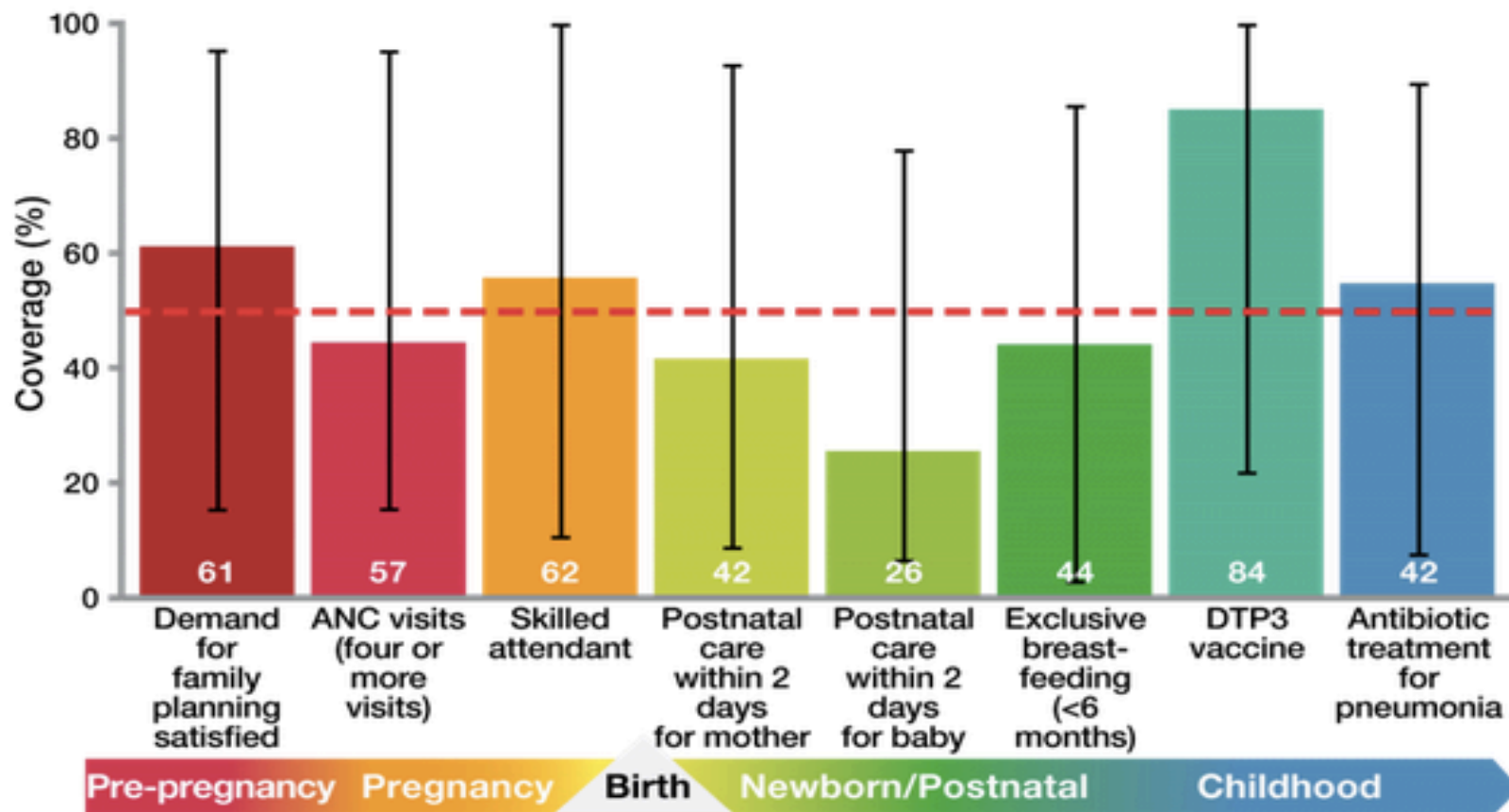
Countdown to 2015. Accountability for Maternal, Newborn and Child Survival: 2013 Update. Note: median for 75 Countdown priority countries with available data: bars refer to ranges between countries.

The mHealth Compendiums document a range of mHealth applications implemented throughout Africa and, in some exceptional cases, in other regions of the world. This summary synthesizes and highlights case study material to help USAID missions and other interested parties identify and access information contained within the Compendiums.

61 CASE STUDIES
covered five programmatic areas:

14 BEHAVIOR CHANGE COMMUNICATION
12 DATA COLLECTION   **6** FINANCE
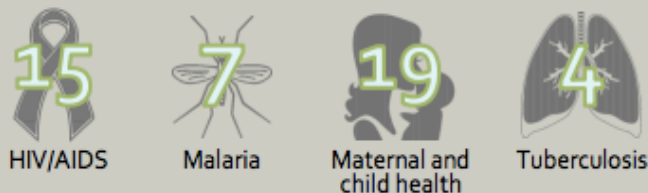**11** LOGISTICS   **18** SERVICE DELIVERY

THE MAJORITY OF mHEALTH PROJECTS ONLY REQUIRED A **BASIC MOBILE PHONE** WHILE

11 projects utilized smartphones and **4** utilized tablets

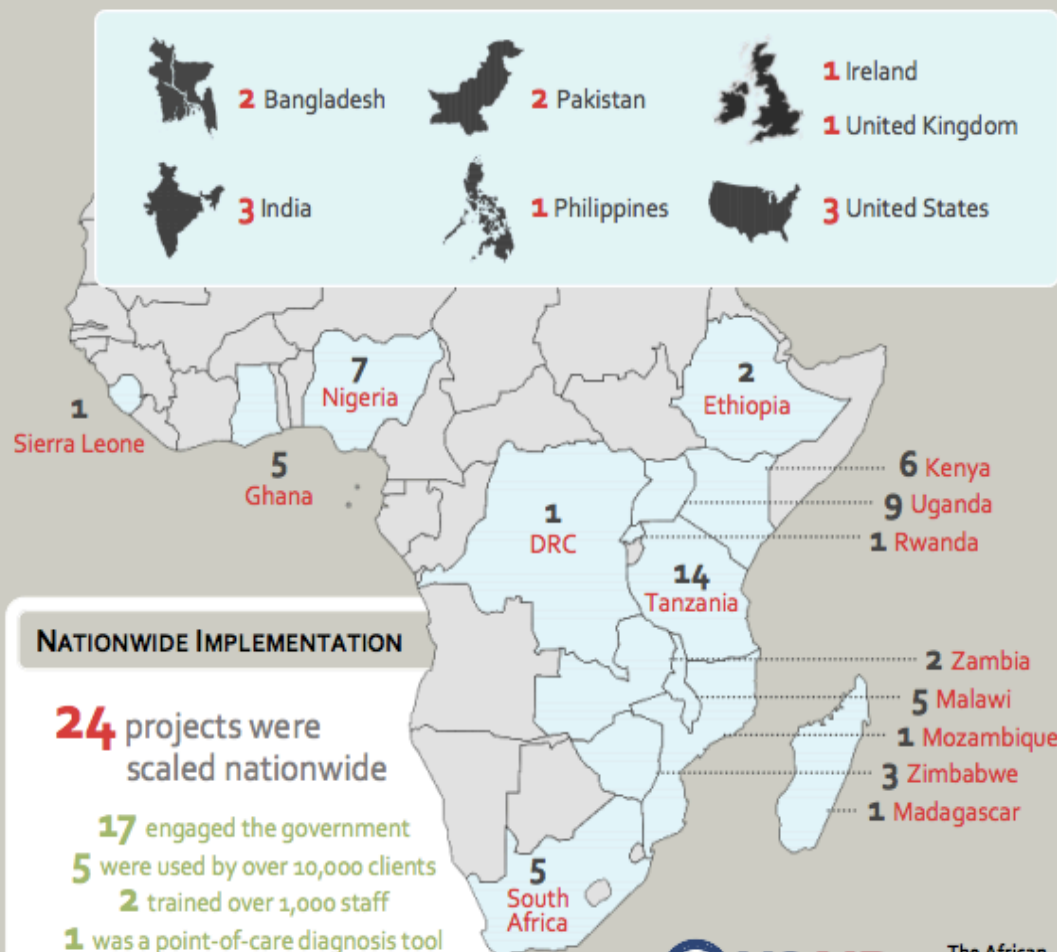## CASE STUDIES ADDRESSED VARIOUS APPLICATION CATEGORIES...

9 Diagnostic and treatment support

2 Disease and epidemic outbreak surveillance

16 Education and Awareness

6 Healthcare financing

4 Healthcare worker communication and training

28 Remote data collection and access

8 Remote monitoring

...AND COVERED THE FOLLOWING PROGRAM TYPES...

15 HIV/AIDS
7 Malaria
19 Maternal and child health
4 Tuberculosis

...AND FUNCTIONS.

42 Short message service
2 Interactive voice response

GEOGRAPHIC LOCATION

2 Bangladesh
2 Pakistan
1 Ireland
1 United Kingdom
3 India
1 Philippines
3 United States

1 Sierra Leone
7 Nigeria
2 Ethiopia
5 Ghana
6 Kenya
9 Uganda
1 Rwanda
1 DRC
14 Tanzania
2 Zambia
5 Malawi
1 Mozambique
3 Zimbabwe
1 Madagascar
5 South Africa

NATIONWIDE IMPLEMENTATION

24 projects were scaled nationwide

17 engaged the government
5 were used by over 10,000 clients
2 trained over 1,000 staff
1 was a point-of-care diagnosis tool
10 were a supply chain management tool

USAID FROM THE AMERICAN PEOPLE

The African Strategies for Health Project

12 Common Applications of mHealth Tools

1. Client education & behaviour change communication (BCC)

2. Sensors & point-of-care diagnostics

3. Registries / vital events tracking

4. Data collection and reporting

5. Electronic health records

6. Electronic decision support
Information, protocols, algorithms, checklists

7. Provider-to-provider communication
User groups, consultation

8. Provider workplanning & scheduling

9. Provider training & education

10. Human resource management

11. Supply chain management

12. Financial transactions & incentives

Labrique AB, Vasudaven L, Kochi E, Fabricant R, Mehl G. mHealth Innovations as Health System Strengthening Tools: 12 Common Applications and a Visual Framework. Global Health Science and Practice. August 8, 2013.

Research Question

"What success has been shown with mHealth-based interventions and strategies for clinical and non-clinical health workers in low and middle-income countries specifically targeting neonatal health?"

Summary of Content

- 9 studies identified
  - 7 quantitative
  - 1 qualitative
  - 1 mixed methods
- No relevant research looking at neonatal mortality or morbidity as an endpoint
- Most studies focused on documenting change in process indicators
- Included particularly relevant case studies from limited landscape scan

LMIC interventions that improve health and survival of preterm babies

- Maternal prophylactic corticosteroids
- Antibiotics following preterm rupture of fetal membranes
- Delayed cord clamping
- Vitamin K supplementation
- Case management of neonatal sepsis
- Room air for resuscitation
- Kangaroo mother care
- Early breastfeeding
- Thermal care
- Surfactant therapy
- Continued distending airway pressure for respiratory distress syndrome

Barros FC, Bhutta ZA, Batra M, Hansen TN, Victora CG, Rubens CE. Global report on preterm birth and stillbirth (3 of 7): evidence for effectiveness of interventions. *BMC pregnancy and childbirth.* 2010;10 Suppl 1:S3.

mHealth Evidence

- 2012 - Gisore et al. *"Community Based Weighing of Newborns and Use of Mobile Phones by Village Elders in Rural Settings in Kenya: A decentralized Approach to Health Care Provision"*

- 2008 - DeRenzi et al. *"e-IMCI: Improving Pediatric Health Care in Low-Income Countries"*

- 2012 - Mitchelle et al, *"Perceived Improvement in Integrated Management of Childhood Implementation Through Use of Mobile Technology: Qualitative Evidence from a Pilot Study"*

CHILD MODULE
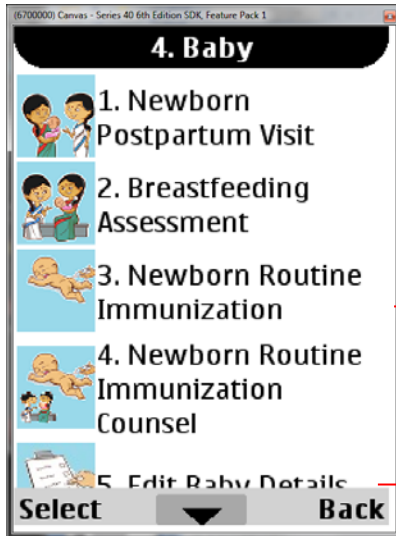
- **Newborn Postpartum Visit**
  - Modify identification info for infant and mother, and update DOB information

- **Breastfeeding Assessment**
  - Information about health status of child after 2 years of age to close case from CommCare
- **Newborn Routine Immunization**
  - BCG, OPV, DPT, Boosters, Polio, Measles, Vitamin A
- **Newborn Routine Immunization Counsel**
  - Information about vaccines, benefits of immunization, side effects, how/where to get immunized
- **Update Baby Info**
  - Update any details about the newborn case
- **Close Baby**
  - To be filled to close the baby case after 2 years of care and full immunization

Postpartum & Newborn Counsel Form

Maternal & Newborn Danger Signs
Topic available throughout postpartum period (42 days after delivery);
Postpartum/maternal danger sign counsel shows if mother is alive;
Newborn danger sign counsel shows if baby alive.

Essential Newborn Care

Topic available during first 7 days of life. Content includes: delayed bathing, immediate & exclusive breastfeeding, colostrum feeding, cord care

Exclusive Breastfeeding

Topic available up to 6 months after delivery.

Special care for low birth weight/premature babies

Topic available throughout postpartum period (42 days after delivery). Content includes: extra warmth for lbw, frequent breastfeeding, and prevention of infection

Bhavsar M, Hensley M. Dimagi and Catholic Relief Services. 2013.

LMIC interventions to reduce neonatal mortality from intra-partum causes

- Careful monitoring of the fetal heart tones via auscultation with a fetoscope or handheld Doppler device to identify abnormal fetal heart patterns

- Use of the partograph during labor to correctly identify prolonged and/or obstructed labor

- Access to timely Cesarean delivery

- Access to high quality emergency obstetric care

- Simplified Neonatal Resuscitation (HBB)

Wall SN, Lee AC, Carlo W, et al. Reducing intrapartum-related neonatal deaths in low- and middle-income countries-what works? *Seminars in perinatology.* Dec 2010;34(6):395-407.

mHealth Evidence

- 2012 - Lund et al, *"Mobile Phones as a Health Communication Tool to Improve Skilled Attendance at Delivery in Zanzibar: A Cluster-Randomized Controlled Trial"*

- 2012 Ngabo et al, *"Designing and Implementing an Innovative SMS-based Alert System (RapidSMS- MCH) to Monitor Pregnancy and Reduce Maternal and Child Deaths in Rwanda"*

- MCHIP *– Maternal and early Neonatal Health Quality of Care (MNH QoC)*

mHBB Data Collection and Reporting System

HBB TRAINING

SET-UP
Trainer coordinates with health facility administrator and other MOH officials to identify available trainees and set up HBB course.

REGISTRATION
Trainees notified by SMS message with request to register for course.
Trainees receive confirmation and course reminders via SMS.

PRE-TEST
Trainee registers for course and completes Written Knowledge Pre-test using SMS text messaging.

HBB COURSE
Trainer receives SMS confirmation of Trainee registration
Trainee attends course; Trainer completes course evaluations.

POST-TEST
Trainee completes Written Knowledge post-test using SMS text messaging.

SURVEYS
Trainees and Trainers complete Course Surveys using either SMS messaging or smart phone.

REFRESHER
Just-in-time video refresher training, with pre-test/post-test questions.

MOTIVATIONAL MESSAGING

INCENTIVES

SECURE ACCESS

SMS Messaging

Database   Web Server

TECHNOLOGY PLATFORM

BI-DIRECTIONAL STAKEHOLDER REPORTING

- HBB Providers
- Community Health Workers
- HBB Champions ----- Health Facility
- Regional Orgs
- National Orgs
- International Orgs

POTENTIAL REPORTING DOMAINS

- Resuscitation Debriefing

- Birth Registry
- Early postnatal follow-up
- Perinatal Audit

- Morbidity/Mortality Indicators
- NR Commodity Surveys
- Clinical Mentoring

- Resource allocation
- Supply chain logistics; commodities tracking
- Cost-analysis
- HMIS indicators
- M & E indicators

LMIC interventions to reduce neonatal mortality from infectious causes

- Treatment of maternal urinary and genital tract infections
- Antibiotic treatment of mothers with preterm premature rupture of membranes
- Chlorhexidine application to the umbilical cord stump
- Kangaroo mother care (KMC)
- Early and exclusive breastfeeding

Ganatra HA, Zaidi AK. Neonatal infections in the developing world. *Seminars in perinatology.* Dec 2010;34(6):416-425.

mHealth Evidence

- 2012 - Seidenberg et al, *"Early Infant Diagnosis of HIV Infection in Zambia Through Phone Texting of Blood Results"*

- 2013 – Binagwaho et al, "Scaling up Early Infant Diagnosis of HIV in Rwanda, 2008-2010"

- 2010 - Kaewkungwa et al, "Application of Smart Phone in " Better Border Healthcare Program": A Module for Mother and Child Care"

- 2012 – Zhang et al, "Smartphone Versus Pen-and-Paper Data Collection of Infant Feeding Practices in Rural China"

Summary of Evidence

There is some evidence that use of mobile technologies by different levels of health workers in low resource settings can:

• Increase maternal ANC attendance and child immunization rates

• Increase skilled attendance at birth and facility delivery

• Increased registration of pregnancies and births

Summary of Evidence cont.

• Improve monitoring of quality of intrapartum care

• Help identify preterm and small babies

• Expedite early infant diagnosis of HIV

• Improve health workers use of IMCI algorithm

• Improve community survey processes for collecting data on breastfeeding practices

Opportunities for Newborn mHealth

- Supporting scale up of newborn resuscitation programs
- Mobile tracking systems for essential newborn commodities
- Creating tools for clinical decision support and documentation of intrapartum care
- Harmonization of newborn data collection to allow access to aggregate data sets
- Creating integrated systems where maternal and newborn data flow between different levels of healthcare system
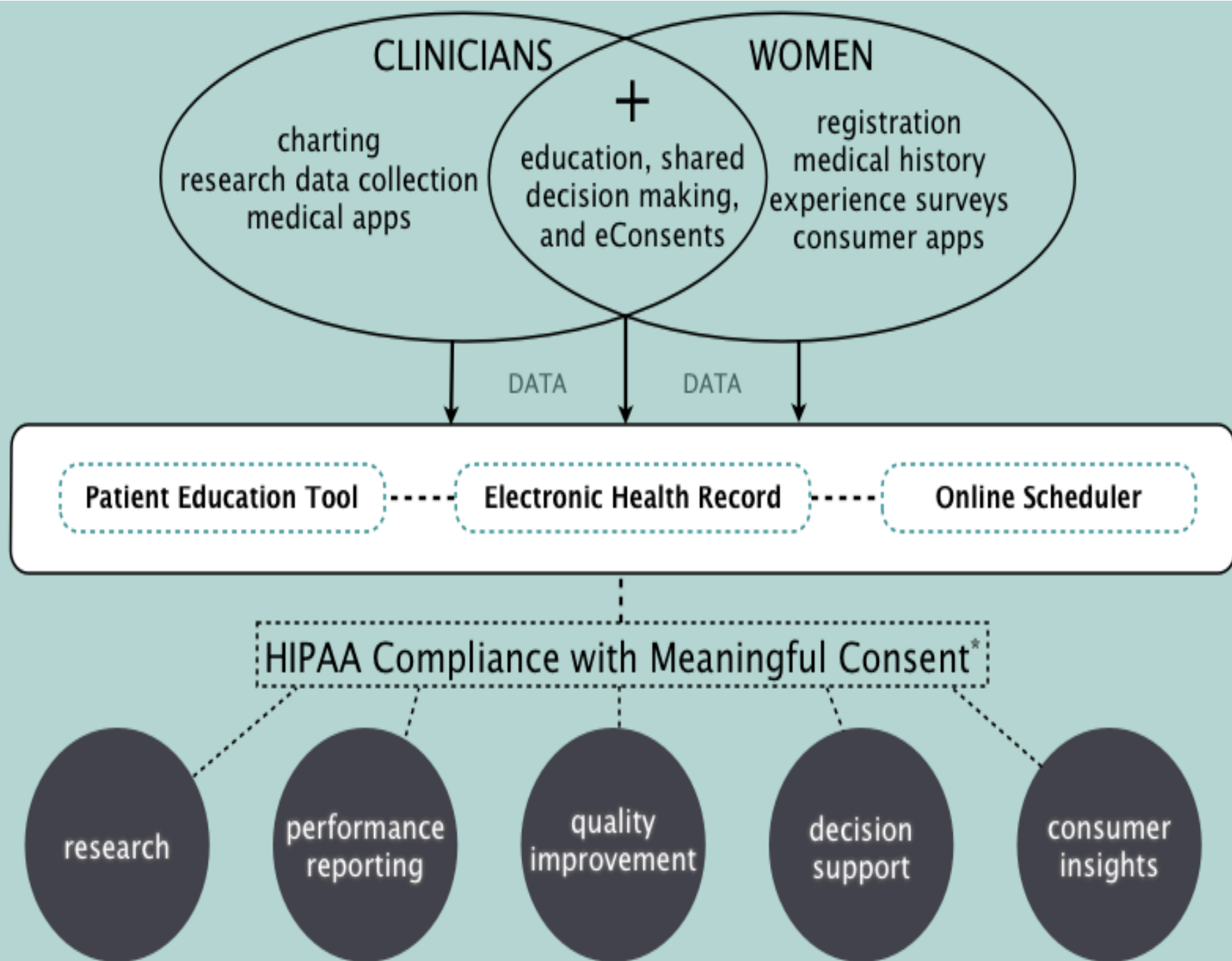
Products + Partners + Platform

Products

- Electronic Health Record
- Patient Education, e-Consents, and Secure Messaging
- Online Appointment Scheduling

Partners

- Content (Childbirth Connection, Lamaze International)
- Applications (Good Measures nutrition app)
- Co-development partners (American Association of Birth Centers, American College of Nurse Midwives, MANA Stats)

Platform

- Data Registry and Health Information Exchange

SECURE PLATFORM

CLINICIANS

WOMEN

+

charting
research data collection
medical apps

education, shared
decision making,
and eConsents

registration
medical history
experience surveys
consumer apps

DATA   DATA

Patient Education Tool - - - Electronic Health Record - - - Online Scheduler

HIPAA Compliance with Meaningful Consent*

research

performance
reporting

quality
improvement

decision
support

consumer
insights

Maternal Concept Lab:
Creating a Common Language for Electronic Maternal, Newborn and Child Health Data

MCL Standardized Terminology & Indicators

Community
Based MNCH Risk
Assessment Data

Clinic
Based
MNCH Data

Hospital
Based
MNCH Data

Open Source Tools
- Cloud-based terminology services
- Repository of standards-based MNCH Content
- MNCH core data sets
- Interfaces between major platforms
- MNCH community of practice

Improved MNCH Data
For evaluation, research, vital statistics and service improvement

Thank you!