



# Mobile WaCH

Mobile Solutions for Women's and Children's Health in Kenya:  
A randomized controlled trial

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PHSKC-SPRC Lunchbox talk  
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# Outline

- **Background:** *mHealth*, and *mHealth* for maternal child health (MCH), *mHealth* for HIV
- **Mobile WaCH** introduction
- **Phase I results** – formative work
- **Phase II baseline results**
  - Demographics
  - Technology experience
  - Process indicators
  - Messaging
- **Preliminary conclusions**
- **Future directions** – use of SMS and B+



BACKGROUND: *mhealth*, and *mhealth*  
for maternal child health (MCH) and  
HIV care

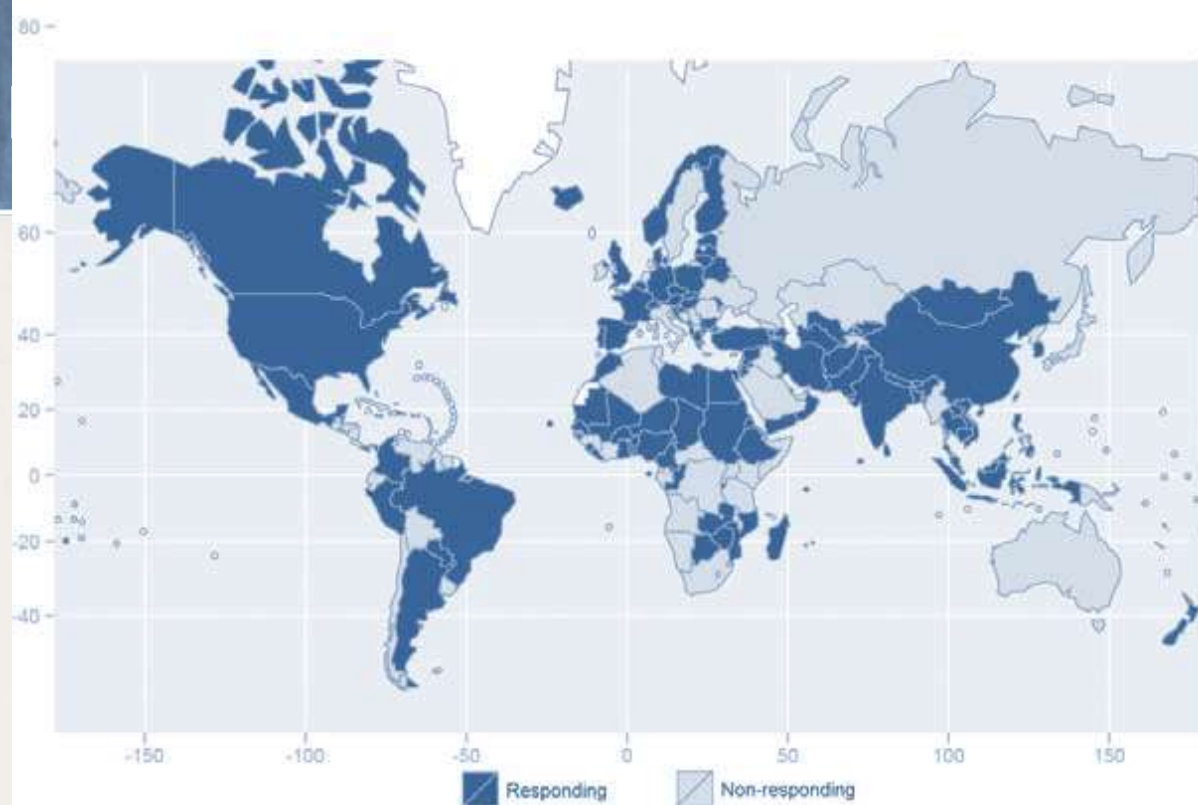


Mobile  
WaCH



Mobile health (*mHealth*) can be defined as:

*Medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, tablets, personal digital assistants (PDAs), and other wireless devices.*



**83%** of WHO member countries reported having at least one *mHealth* initiative in their country.

**77%** of responding low-income countries reported at least one *mHealth* initiative in their country, making them only ten percent behind high-income countries.



# *mHealth* for Maternal Child Health (MCH) & HIV

## Education & Awareness

Motivational and informational text messages to support behavior change and health literacy.

## Monitoring and Evaluation

Move toward real-time monitoring of health outcomes.

## Monitoring Supply Chain Management

Tracking and replenishment of testing and treatment supplies.

## Diagnostic Treatment and Support

Expedited test results to improve treatment and outcomes.

## Training Health Workers

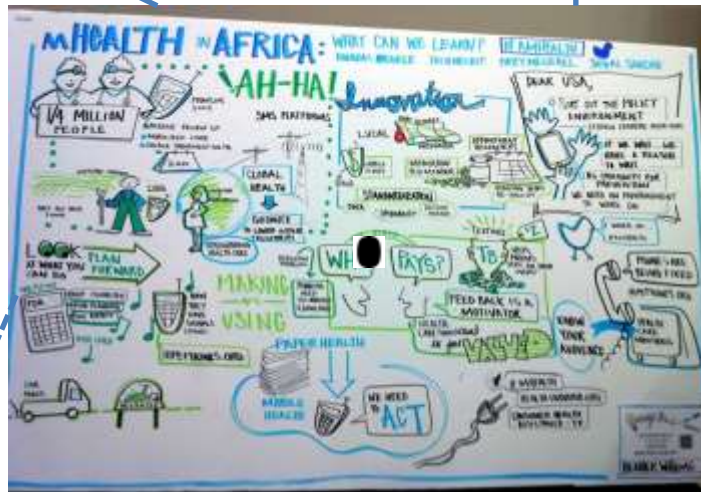
Use of mLearning to deliver educational content for initial and refresher training.

## Remote Data Collection

Health workers using mobile phones to access EHRs and update records.

## Managing Appointments and Referrals

Greatest body of evidence showing cost savings.





# Evidence for mHealth to improve MCH

Mobile technologies and communication strategies in an urban Midwifery Group Practice setting. An exploratory study

Amanda Forti<sup>a,b,\*</sup>, Helen Stapleton<sup>a,b,1</sup>, Sue Kildea<sup>a,b,2</sup>

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Pregnancy & Childbirth

RESEARCH ARTICLE

Open Access

## Mobile phones improve antenatal care attendance in Zanzibar: a cluster randomized controlled trial

Stine Lund<sup>1\*</sup>, Birgitte B Nielsen<sup>2</sup>, Maryam Hemed<sup>3</sup>, Ida M Boas<sup>1</sup>, Azzah Said<sup>3</sup>, Khadija Said<sup>3</sup>, Mkoko H Makungu<sup>3</sup> and Vibeke Rasch<sup>1,4</sup>

## Mobile phones as a health communication tool to improve skilled attendance at delivery in Zanzibar: a cluster-randomised controlled trial

S Lund,<sup>a</sup> M Hemed,<sup>b</sup> BB Nielsen,<sup>c</sup> A Said,<sup>b</sup> K Said,<sup>b</sup> MH Makungu,<sup>b</sup> V Rasch<sup>a,d</sup>

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Accepted 9 May 2012. Published Online 17 July 2012.

## Initial findings

- Minimize barriers and facilitate obstetric referrals
- Ameliorate human capacity issues
- Support information for health promotion
- Improve data collection and management

## Current studies

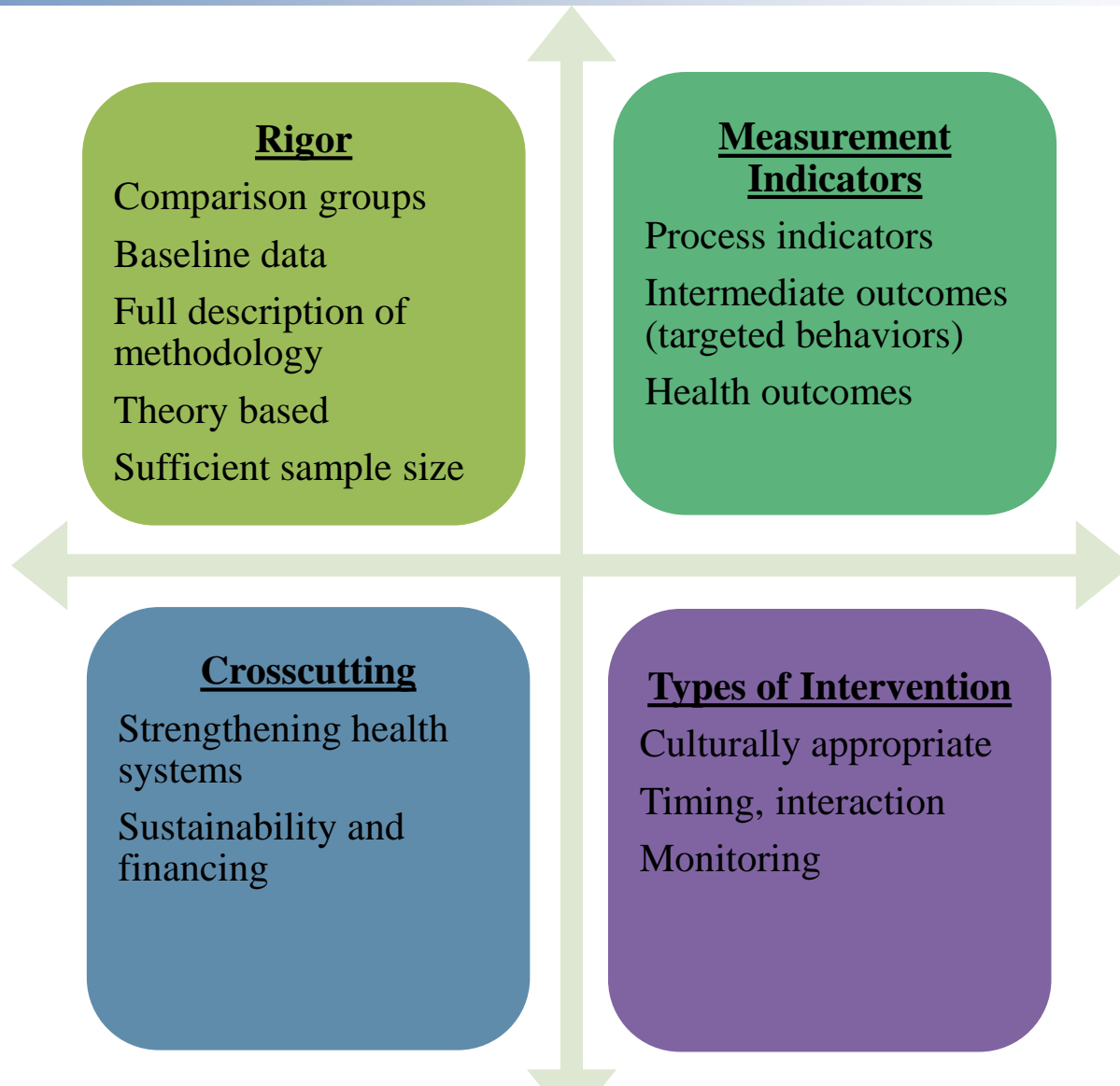
- Usability, feasibility and acceptance<sup>(1-5)</sup>
- Health outcomes: mortality<sup>(6)</sup>, vaccination coverage<sup>(7)</sup>, pregnancy outcomes<sup>(8)</sup>, maternal infant outcomes<sup>(9)</sup>

# Evidence for mHealth to improve HIV Care

- SMS is inexpensive, acceptable and favored by patients (Lester et al, Reid et al, Kinyua et al).
- Text messages make patients feel cared for (Ingersoll et al) and motivates them not to quit (Thiago et al).
- Text messaging found to significantly increase adherence and HIV viral suppression (Lester et al, Pop-Eleches, Horvath et al, Martini et al, Rodrigues et al).
- Barriers to be considered: HIV stigma and non-disclosure. How will this affect adherence in the context of text messaging?



# Evidence gaps in *mHealth* for MCH





# Mobile WaCH: Objective



To design a *mHealth* intervention for pregnant women to increase uptake of proven MCH strategies, while addressing the previously identified evidence gaps

**Phase I:**  
Formative work



**Phase 2:**  
Randomized  
Controlled Trial



**Phase 3:**  
Follow-up

## Types of Intervention

Culturally appropriate  
Timing, interaction  
Monitoring

## Rigor

Comparison groups  
Baseline data  
Full description of methodology  
Theory based  
Sufficient sample size

## Measurement Indicators

Process indicators  
Intermediate outcomes (targeted behaviors)  
Health outcomes

## Crosscutting

Strengthening health systems  
Sustainability and financing

# PHASE ONE: Message development



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# Phase I: Qualitative investigation

**Purpose:** To develop culturally appropriate and effective SMS messaging for pregnant and postpartum women

**Research question:** How can SMS messaging work to reduce barriers and function as a facilitator to uptake of MCH services?



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# Phase I: Methods

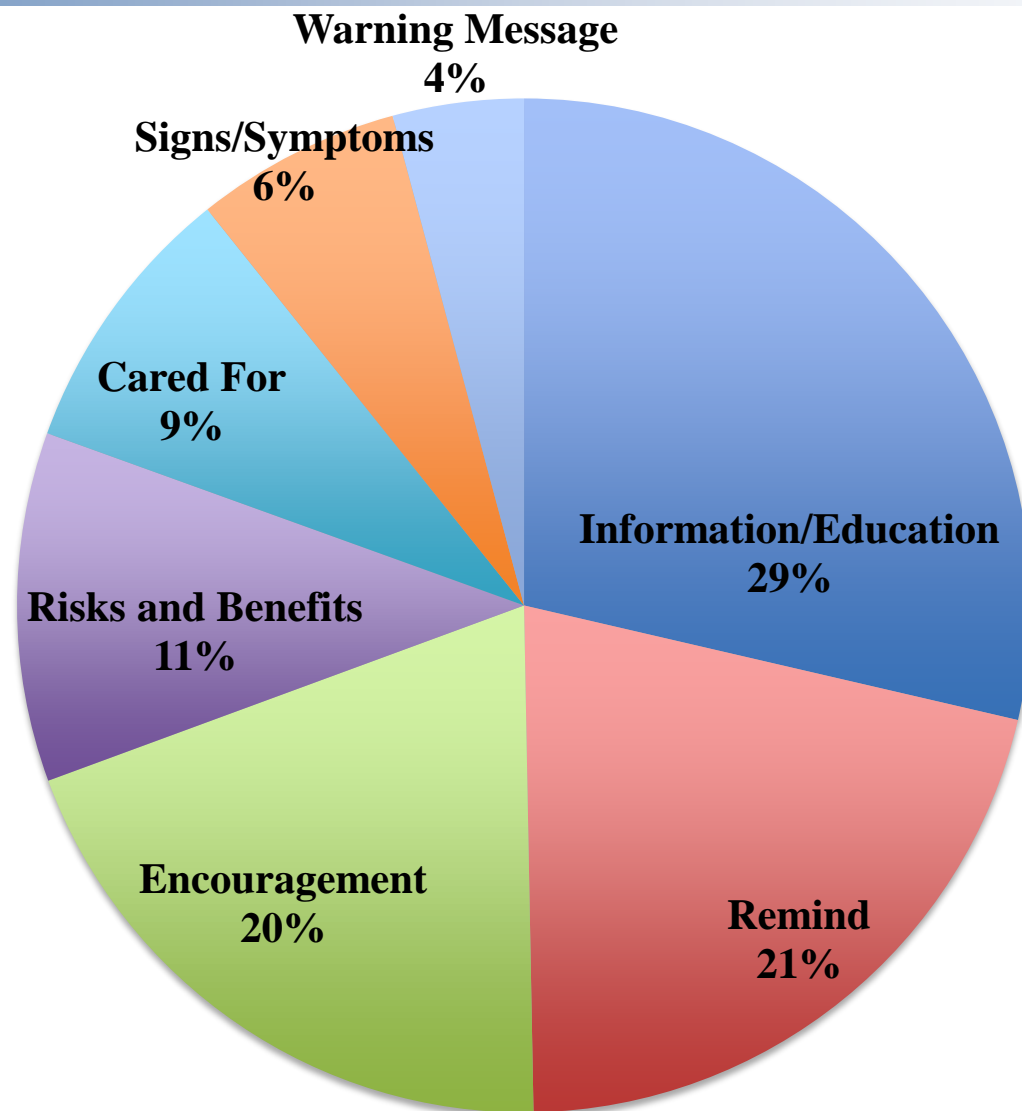


- **Focus Group Discussions**
  - 3 pregnant and postpartum women
  - 1 providers
- Mathare North Health Centre, Nairobi, Kenya
- **Theoretical frameworks**
  - Social Cognitive Theory
  - Health Belief Model
- **Analysis**
  - Grounded theory
  - Dedoose





# Mechanisms by which SMS may increase uptake of MCH services



# Phase 1: Results

*“When you send sms, I would also feel wanted in another certain place so definitely when labour comes I would want to go where there is a friend of mine who can support me. I think it can really help.” FGD #3 Provider*

*“It can encourage because if you send me a message, it will remind me to go to hospital to give birth, as a mother I will feel that there is someone who cares and is ready to assist you. And as such it will encourage me to go to hospital because the one who sent an sms saw that am good giving birth in hospital and as such I will have morale to come to hospital because you cannot send me a message if you will not assist me.” FGD #2 Participant 2*

# Phase 1: Results

*“As for me, it can make me to come to hospital because I have not received such a message only once, maybe it keeps on coming into my phone I will see that some people do care for me and are thinking good about me. So with such message I get encouraged and will not keep me home I will just go to a health facility.” FGD#1 Participant 3*



# Phase 1: Conclusions

- SMS messaging, especially interactive, may **make women feel cared for and motivate them to uptake services.**
- Messaging can be used for information but it may be just as important to use it for **encouragement and creating a feeling of being “cared for”.**

# Messages

- <Name>, this is Kerubo from clinic. Hope you are well. We can ensure your baby is growing. When is your next visit? Do you have questions for the nurse? (29 weeks)
- <Name>, this is Kerubo from clinic. It is safest to deliver your baby at the clinic or hospital. In an emergency at home it may be too late to get help. (2) There are always nurses here to help you. Have you talked to your nurse about where you should deliver your baby? What is your plan? (30 weeks)
- <Name>, this is Kerubo from Mathare clinic. The IUCD or coil is a small device for family planning. It is easy to put in, safe and very effective. (2) Have you heard about the IUCD or coil? Do you know anyone who has used it? (32 weeks)
- <Name>, this is Kerubo from Mathare clinic. Each labor is different. If something goes wrong with labor @ home it may be too late for help. The hospital can monitor you & your baby. (2) Where did you have your last baby? (34 weeks)

- <Name>, this is Kerubo from Mathare clinic. Regular, strong stomach pains are a sign of labour. If you feel strong tightening of your belly, leaking of fluid or any bleeding go to the clinic. (2) Have you had any labor pains? How often do you feel them? Are you worried? (35 weeks)
- <Name>, this is Kerubo from Mathare clinic. When you come in for labour, we will give you birth notification for the baby. Delivery at the clinic could save your baby's life. (2) Do you have any questions about where to go in labor and how to get there? (36 weeks)
- <Name>, this is Kerubo from the ANC clinic. Breastfeeding a baby right after birth helps the milk come. The first yellow sticky milk has many vitamins. (2) Milk has all the water the baby needs, avoid other liquids. Are you planning to breastfeed? (38 weeks)

# PHASE TWO: Randomized controlled trial (RCT)



**Mobile  
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# Aim 1

Determine the effect of systematic provision of tailored one-way SMS or two-way SMS dialogue on uptake of MCH strategies

- **antenatal care attendance**
- **use of skilled delivery services**
- **post-partum contraceptive uptake**
- **infant immunizations**
- **practice of exclusive breast feeding**



# Aims 2,3

- To determine co-factors for uptake of MCH strategies and determine the *potential mechanisms of SMS/ dialogue messaging effect*.
- To determine the impact of SMS and dialogue messaging on perceived birth preparedness and quality of care received.



# Study Plan



**Participants:** 300 pregnant women

**Site:** Mathare North Health Centre,  
Nairobi, Kenya

**Recruitment:** 1<sup>st</sup> ANC visit

**Eligibility:** Receive, read messages

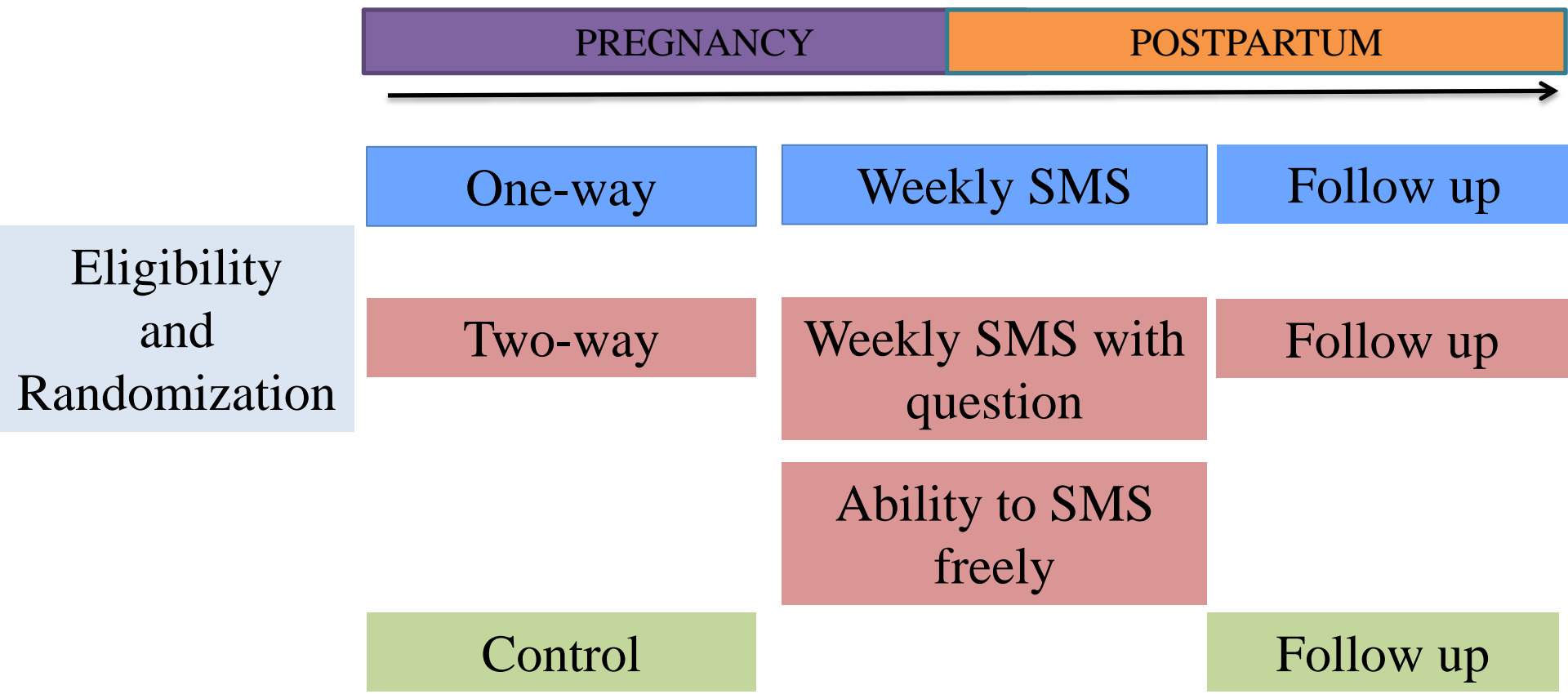
**Follow up:** (6 months) Integration  
into MCH infant vaccination  
schedule

- 2 weeks
- 10 weeks
- 24 weeks





# Intervention





## Message History

Conversation ▾

i am already taking ferrous folic tablets for the second time now are they for iron or do i go for others.

*Prompted:* ✓

Study Nurse: Jan. 17, 2014, 7:19 a.m.  
The iron tablets are given for free at the clinic. please go and collect.

Esther Wangari: Jan. 16, 2014, 10:48 p.m.  
i feel okey but i wonder why of late i hav lost my appetite though am taking porridge more often.what is the cause?

*Prompted:* ✓

Esther Wangari: Jan. 14, 2014, 11:56 a.m.  
yes i need iron

*Prompted:* ✓

System: Jan. 13, 2014, 1 p.m.  
Esther this is Kerubo from clinic. Iron helps carry nutrition to your baby. If it is low, you feel tired. Are you taking iron or do you need tablets?

Study Nurse: Jan. 8, 2014, 2:45 p.m.  
Yes,because the baby presses on the stomach and that causes reflux.

Esther Wangari: Jan. 8, 2014, 1:30 p.m.  
when you say i eat small frequent meals,do you mean eating to my fill may cause heartburn.

*Prompted:* ✓

# Mobile WaCH development



Computer Science & Engineering

UNIVERSITY of WASHINGTON





Phone Number: 254722980686 -- Rael (#202) -- Study Group: Two Way

- Search...
- Group
- (#132): Carolyne Apr 11  
Last SMS Mar 22.  
1 unread messages.
  - (#242): Nancy May 06  
Last SMS Mar 22.  
1 unread messages.
  - (#100): Gladys Apr 15  
Last SMS Mar 22.  
1 unread messages.
  - (#155): Mary Apr 03  
Last SMS Mar 21.  
1 unread messages.
  - (#071): Jane Apr 15  
Last SMS Mar 21.
  - (#184): Stephanie May 12  
Last SMS Mar 20.
  - (#202): Rael Mar 20  
Last SMS Mar 20.
  - (#169): Stella Apr 24  
Last SMS Mar 20.
  - (#195): Jackline Mar 20  
Last SMS Mar 19.
  - (#248): Beatrice May 14  
Last SMS Mar 19.
  - (#154): Rachel Mar 25  
Last SMS Mar 19.
  - (#140): Jane Apr 21  
Last SMS Mar 19.

✉ ☎

TO: RAEL (#202)

Send message

0/144 characters, 0 messages Send

Message History Conversation

- Study Nurse: March 9, 2014, 5:25 p.m.  
Hi Rael, did she confirm from a doctor that the pain in thye leg was due to the implant..
- Rael Nyansiaboka: March 6, 2014, 5:47 p.m.  
I've heard about it. My best friend was using the one for 5yrs. It was very effective, but the problem started on her 3rd yr one leg was hurting she couldn't walk until she was forced to remove it & she recovered within a short time.  
*Prompted:*
- System: March 6, 2014, 1 p.m.  
Have you heard about the Implant? Do you know anyone who has used it?
- System: March 6, 2014, 1 p.m.  
Deal this is Kenjo from Mathara

**Patient Information**

ID number: **202**

Name: **client name**

Study Group: **Two Way**

Birthday: **client birthday**

Phone Number: **phone number**

Pregnancy Status: **Pregnant**

Expected Due Date: **April 30, 2014**

Next Visit: **March 20, 2014**

Registration Key: **BPMFD Not Validated**

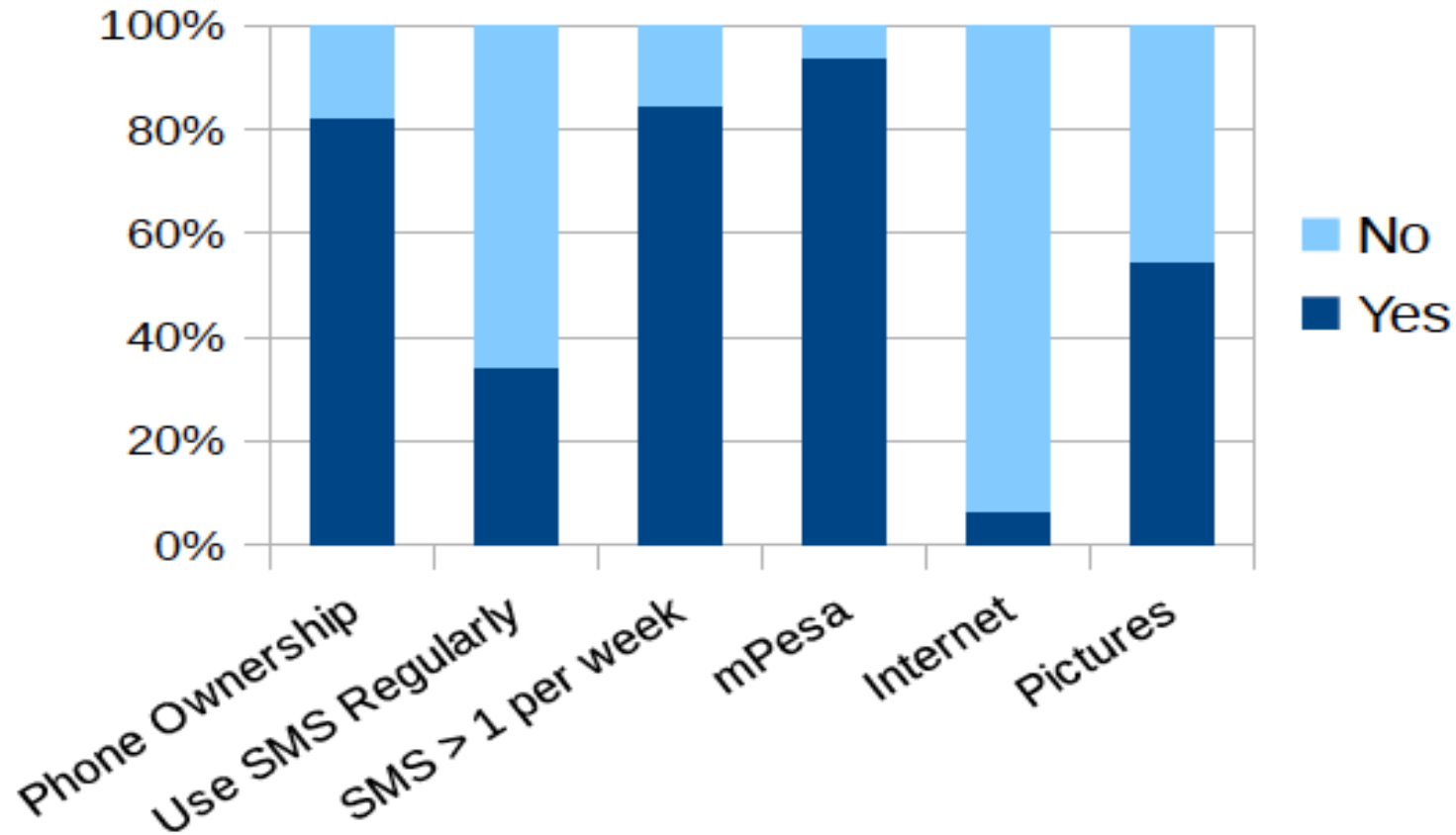
Notes

Clinic Visit History

# Baseline characteristics (n=256)

	One-way SMS (n=100)	Two-way SMS (n=100)	Control (n=100)
	Median (IQR) or % (n)	Median (IQR) or % (n)	Median (IQR) or % (n)
<b>Age (years)</b>	23 (21-26)	24 (21-27)	23 (20-26)
<b>Partnered</b>	96 (96)	94 (94)	89 (89)
<b>Education</b>			
None	1%	0	2%
Some	47%	38%	42%
Primary completed	15%	20%	16%
Some secondary	31%	30%	33%
Secondary completed	6%	12%	7%
<b>Income (\$/mo)</b>	69 (58-104)	69 (58-127)	69 (52-93)
<b>Gestational Age (weeks)</b>	27 (21-31)	26 (21-30)	27 (24-31)
<b>mean # of pregnancies</b>	1.7	1.9	1.8
<b>Previous delivery</b>	42%	46%	49%
<b>Previous home delivery</b>	11%	17%	14%

# Baseline experience with technology



**Figure 2: Self reported technology usage of study participants.**

# Mobile phone communications (Process indicators)

<b>Messaging Characteristics</b>	<b>Two-way SMS (n=100) % (n)</b>
<b>Messages sent</b>	>2000
<b>Regular responders (&gt;2/month)</b>	61%  (range 0-43)
<b>Non-responders (received &gt;10 SMS)</b>	13%
<b>Messages sent from one-way group only</b>	33





# Messaging

girl ?

Mary Susan: March 2, 2014, 8:01 p.m.  
I didn't go hosi because it was very late,there was a midwife cald for asistance. *Prompted:* ✓

Kerubo: March 2, 2014, 5:07 p.m.  
you should get a birth notification from the hospital u delivered in.

Mary Susan: March 2, 2014, 2:45 p.m.  
How will i get nortification letter? *Prompted:* ✓

Kerubo: March 2, 2014, 1:23 p.m.  
congratulations on the birth of your child.

Mary Susan: March 2, 2014, 11:36 a.m.  
Yesterday the pain was too much at night til i give birth at 4.12AM. *Prompted:* ✓

## Message History

Conversation

can take the baby to a private hospital for injection.the

Josephine Achieng: Dec. 11, 2013, 8:43 p.m.  
Hi,kerubo am stranded since Doctors are on strike and my baby hasn't injected on her thigh what can i do? *Prompted:* ✓

Josephine Achieng: Dec. 10, 2013, 8:04 a.m.  
Hi, i haven't selected a method. *Prompted:* ✓


System: Dec. 10, 2013, 8 a.m.  
We will send you information about options. Have you already selected a method? What type?


System: Dec. 10, 2013, 8 a.m.  
Josephine this is Kerubo from Mathare clinic. It is best to think about family planning before you go to the clinic and have a plan in place.


# Messaging


## Message History

Conversation :

 Kerubo: Feb. 7, 2014, 12:19 p.m.  
Yes it is possible to have other STDs.  
U can be tested for all the stds if you  
are worried.

 Jane Akademere: Feb. 6, 2014, 6:41 p.m.  
i'was tested 4 siphilis on monday  
3rd,is it posible someone can stil  
have other std? *Prompted:*


 Kerubo: Feb. 5, 2014, 4:12 p.m.  
Hi Jane, please when you come to  
the clinic, do passby my room so that  
i can explain to you what rhesus  
means. Thanks


 Jane Akademere: Feb. 4, 2014, 1:56 p.m.  
no bleeding.i'don't undstand the  
word rhesus. *Prompted:*


 System: Feb. 2, 2014, 1 p.m.  
Jane this is Kerubo from Mathare

## Message History

Conversation :

 Martha Kaikai: March 26, 2014, 5:55 p.m.  
I will come they plz with my  
husband or my siz in law or bor  
in law thank u. *Prompted:*

 System: March 23, 2014, 1 p.m.  
Where do you plan to deliver your  
baby? Who will come with you to the  
clinic?

 System: March 23, 2014, 1 p.m.  
Martha this is Kerubo from Mathare  
clinic. The cost of having your baby at  
Mathare is now free. Put a little  
money aside each week to have your  
baby in a safe place.

 Martha Kaikai: March 17, 2014, 8:44 p.m.  
Yes i did, gud 9t 2 u may God be  
wth u. *Prompted:*

# Conclusions

- Despite low use of SMS prior to the study the majority of women in the two-way SMS group are responding to messaging both prompted and spontaneously
- Response rates high in comparison to other two-way studies (WeITel= 30-33%)

# Future directions

- Follow-up
- Analyze data for outcomes
- Analyze content of messaging
- Post-trial interviews
- SMS for PMTCT and beyond



NEXT STEPS: *mHealth* for Option B+



Mobile  
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# PMTCT-ART Is Being Scaled Up: Requires Long-Term Retention/ Adherence

- SDNVP → Option A/B/B+ → ART for life
- PMTCT programs: loss to follow-up rates ranging from 19% to 89.4%
- Postpartum adherence is significantly lower than during pregnancy
- Staff shortages, inadequate confidentiality, limited counseling time, fear of stigma, distance, and user fees as reasons for failing to follow-up.



	Woman receives:		Infant Receives:
	Treatment (for CD4 count $\leq$ 350 cells/mm <sup>3</sup> )	Prophylaxis (for CD4 count $>$ 350 cells/mm <sup>3</sup> )	
<b>Option A<sup>a</sup></b>	Triple ARVs starting as soon as diagnosed, <i>continued for life</i>	<p><i>Antepartum:</i> AZT starting as early as 14 weeks gestation</p> <p><i>Intrapartum:</i> at onset of labour, single-dose NVP and first dose of AZT/3TC</p> <p><i>Postpartum:</i> daily AZT/3TC through 7 days postpartum</p>	Daily NVP from birth until 1 week after cessation of all breastfeeding; or, if not breastfeeding or if mother is on treatment, through age 4–6 weeks
<b>Option B<sup>a</sup></b>	<i>Same initial ARVs for both<sup>b</sup>:</i>		Daily NVP or AZT from birth through age 4–6 weeks regardless of infant feeding method
	Triple ARVs starting as soon as diagnosed, <i>continued for life</i>	Triple ARVs starting as early as 14 weeks gestation and <i>continued intrapartum and through childbirth if not breastfeeding or until 1 week after cessation of all breastfeeding</i>	
<b>Option B+</b>	<i>Same for treatment and prophylaxis<sup>b</sup>:</i>		Daily NVP or AZT from birth through age 4–6 weeks regardless of infant feeding method
	Regardless of CD4 count, triple ARVs starting as soon as diagnosed, <sup>c</sup> <i>continued for life</i>		

Note: "Triple ARVs" refers to the use of one of the recommended 3-drug fully suppressive treatment options. For the drug abbreviations in the table: AZT (azidothymidine, zidovudine [ZDV]); NVP (nevirapine); 3TC (lamivudine).

<sup>a</sup> Recommended in WHO 2010 PMTCT guidelines; single dose NVP and AZT + 3TC intrapartum and postpartum tail can be omitted if the mother received more than 4 weeks of AZT during pregnancy; in this case continue maternal AZT twice daily during labour and stop at delivery

<sup>b</sup> True only for EFV-based first-line ART; NVP-based ART not recommended for prophylaxis (CD4  $>$ 350)

<sup>c</sup> Formal recommendations for Option B+ have not been made, but presumably ART would start at diagnosis.

# WHAT HAPPENS POSTPARTUM AND POSTNEONATAL PERIOD

Different motivations for ART may lead to decreasing adherence following the highest transmission risk period.

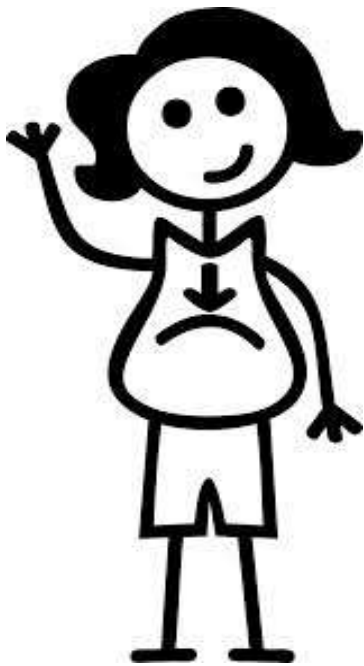


Reported disinterest in maintaining ART subsequent to PMTCT


mHealth Enhances ART Adherence- can it work for this?



**AIM 1:** To compare mother-infant pairs receiving systematic, tailored **one-way SMS** messaging vs. **two-way SMS** dialogue vs. **control** (no SMS) for outcomes measured during 2-year postpartum follow-up



- Maternal retention in care
- ART refills
- Virologic treatment failure
- ART drug resistance
- Infant HIV infection
- HIV-free survival at 6 weeks, 6 months and 24 months
- Maternal perceptions of acceptability, utility and strengths/weaknesses of one-way and two-way SMS

- **AIM 2:** To determine correlates of maternal treatment failure & infant HIV infection **stratified by arm**
- Characterize SMS interactions among women in the two-way SMS arm 
  - frequency of and changes in interactivity over time
  - relationship to pivotal time-points (delivery, cessation of breastfeeding, transfer of care to ART clinic)
  - characteristics of high and low ‘interactors’, and topics motivating interactions.

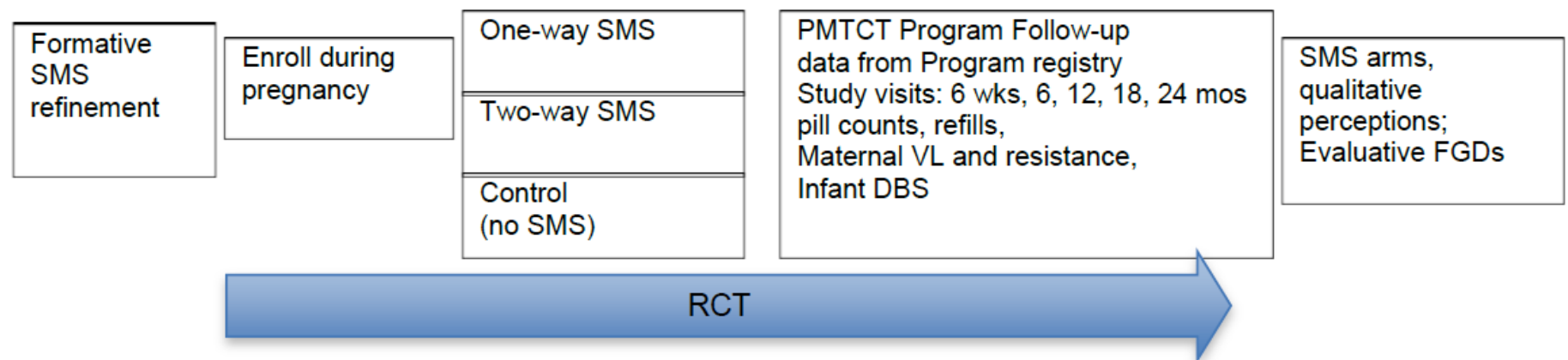
# Cost Effectiveness

- **AIM 3:** To assess the cost-effectiveness of **one-way** SMS and **two-way** SMS interactions: a) Estimate net cost savings realized through the reduction of treatment failure and drug resistance. b) Estimate incremental cost-effectiveness in improving infant and maternal health outcomes.

- Team members
- 3 sites (Mathare (Nairobi), Bondo, Ahero)
- 2 nurses and study coordinator
- Data statistical support



Figure 3. Study Flow



## **Timeline:**

**Funding:** May 2014

**Human Subjects submission:** July 2014

**Protocol, data collection forms, database development:** June-December 2014

**Computer system development:** June-September 2014

**Site sensitization:** Winter 2014

**Staff training:** January/ February 2015

**Qualitative:** February 2015

**RCT rollout:** March 2015

# Lessons and Development Concerns



## Messaging

- Escalation didn't work
- Need for frequent monitoring
- More efforts to understand non-responders but...
- Not interfere with the intervention

## System

- Time and effort burden that data collection and system are not linked
- Not linked well with clinic – appointments
- Interface – more data collection friendly

## HIV

- Disclosure verses non-disclosure

# Acknowledgements

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