Mobile WaCH
Mobile Solutions for Women’s and Children’s Health in Kenya:
A randomized controlled trial
• **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 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 Supply Chain Management
Tracking and replenishment of testing and treatment supplies.

Diagnostic Treatment and Support
Expeditied test results to improve treatment and outcomes.

Monitoring and Evaluation
Move toward real-time monitoring of health outcomes.

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

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

Managing Appointments and Referrals
Greatest body of evidence showing cost savings.
Evidence for mHealth to improve MCH

Current studies

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

Initial findings

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

**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

**Types of Intervention**
- Culturally appropriate
- Timing, interaction
- Monitoring
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 ONE: Message development
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?
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

- Information/Education: 29%
- Remind: 21%
- Encouragement: 20%
- Cared For: 9%
- Risks and Benefits: 11%
- Signs/Symptoms: 6%
- Warning Message: 4%
"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**
“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)
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.
Participants: 300 pregnant women

Site: Mathare North Health Centre, Nairobi, Kenya

Recruitment: 1st ANC visit

Eligibility: Receive, read messages

Follow up: (6 months) Integration into MCH infant vaccination schedule
  • 2 weeks
  • 10 weeks
  • 24 weeks
Intervention

Eligibility and Randomization

- One-way
- Two-way
- Control

Weekly SMS
- Weekly SMS with question
- Ability to SMS freely

Follow up

PREGNANCY
POSTPARTUM
Message History

i am already taking ferous tolic 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: 

yes i need iron

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.
Mobile WaCH development

Computer Science & Engineering

UNIVERSITY of WASHINGTON

Mobile WaCH
TO: RAE (202)

Send message

0/144 characters, 0 messages  Send

Message History

Study Nurse: March 9, 2014, 5:25 p.m.
Hi Rael, did she confirm from a doctor that the pain in thy 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.
Rael this is Kenubo from Mathare

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

Figure 2: Self reported technology usage of study participants.
## Mobile phone communications (Process indicators)

<table>
<thead>
<tr>
<th>Messaging Characteristics</th>
<th>Two-way SMS (n=100)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% (n)</td>
</tr>
<tr>
<td>Messages sent</td>
<td>&gt;2000</td>
</tr>
<tr>
<td>Regular responders (&gt;2/month)</td>
<td>61%</td>
</tr>
<tr>
<td></td>
<td>(range 0-43)</td>
</tr>
<tr>
<td>Non-responders (received &gt;10 SMS)</td>
<td>13%</td>
</tr>
<tr>
<td>Messages sent from one-way group only</td>
<td>33</td>
</tr>
</tbody>
</table>
Mary Susan: March 2, 2014, 8:01 p.m.
I didn't go home because it was very late, there was a midwife called for assistance.

Promoted: ✅

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

Promoted: ✅

Mary Susan: March 2, 2014, 2:45 p.m.
How will I get notification letter?

Promoted: ✅

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

Promoted: ✅

Mary Susan: March 2, 2014, 11:36 a.m.
Yesterday the pain was too much at night till I give birth at 4:12 a.m.

Promoted: ✅

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?

Promoted: ✅

Josephine Achieng: Dec. 10, 2013, 8:04 a.m.
Hi, I haven't selected a method.

Promoted: ✅

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**

Yes it is possible to have other STDs. U can be tested for all the stds if you are worried.

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.

Jane Akademere: 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

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

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

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

Martha Kaikai: March 17, 2014, 8:44 p.m.  
Yes i did, gud 9t 2 u may God be wth u.
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 (WelTel= 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+
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.
<table>
<thead>
<tr>
<th>Woman receives:</th>
<th></th>
<th>Infant Receives:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment</td>
<td>Prophylaxis</td>
<td></td>
</tr>
<tr>
<td>(for CD4 count ≤ 350 cells/mm³)</td>
<td>(for CD4 count &gt; 350 cells/mm³)</td>
<td></td>
</tr>
<tr>
<td><strong>Option A³</strong></td>
<td><strong>Antepartum:</strong> AZT starting as early as 14 weeks gestation</td>
<td>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</td>
</tr>
<tr>
<td><strong>Option B³</strong></td>
<td><strong>Intrapartum:</strong> at onset of labour, single-dose NVP and first dose of AZT/3TC</td>
<td><strong>Same initial ARVs for bothｂ:</strong></td>
</tr>
<tr>
<td><strong>Option B+</strong></td>
<td><strong>Postpartum:</strong> daily AZT/3TC through 7 days postpartum</td>
<td><strong>Triple ARVs starting as early as 14 weeks gestation and continued intrapartum and through childbirth if not breastfeeding or until 1 week after cessation of all breastfeeding</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Same for treatment and prophylaxisｂ:</strong></td>
<td><strong>Daily NVP or AZT from birth through age 4–6 weeks regardless of infant feeding method</strong></td>
</tr>
</tbody>
</table>

| 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). |
| a 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 |
| b True only for EFV-based first-line ART; NVP-based ART not recommended for prophylaxis (CD4 >350) |
| c Formal recommendations for Option B+ have not been made, but presumably ART would start at diagnosis. |
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
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
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