

M4D: Connecting and Engaging with End Users

Trevor Perrier
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CSCI 497G/597G: Information and Communication Technologies for Development
Western Washington University



About Me

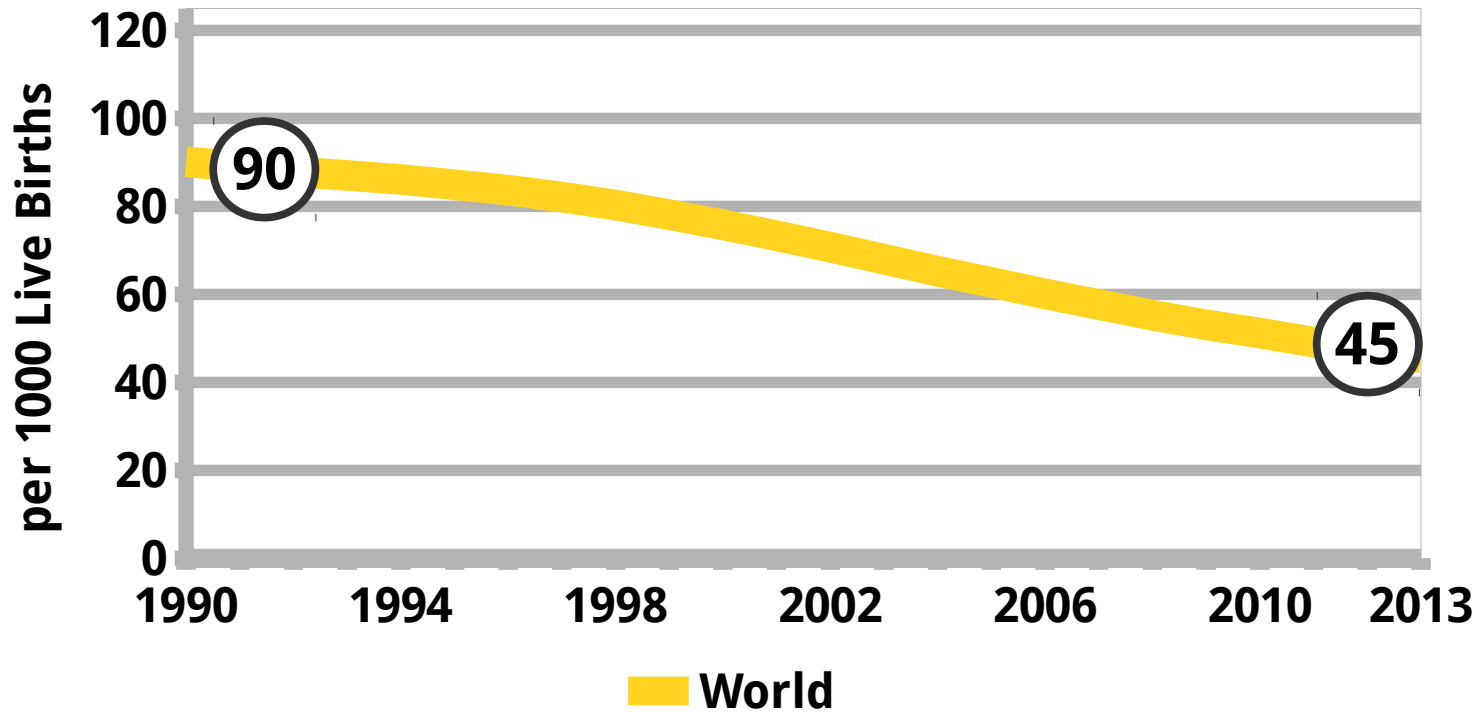
- 4th year UW grad student
- Spent 4 years teaching math and science in the Peace corps (South Africa & Liberia)
- Work on SMS projects in the Sub-Saharan Africa

Convergence of Two Global Themes



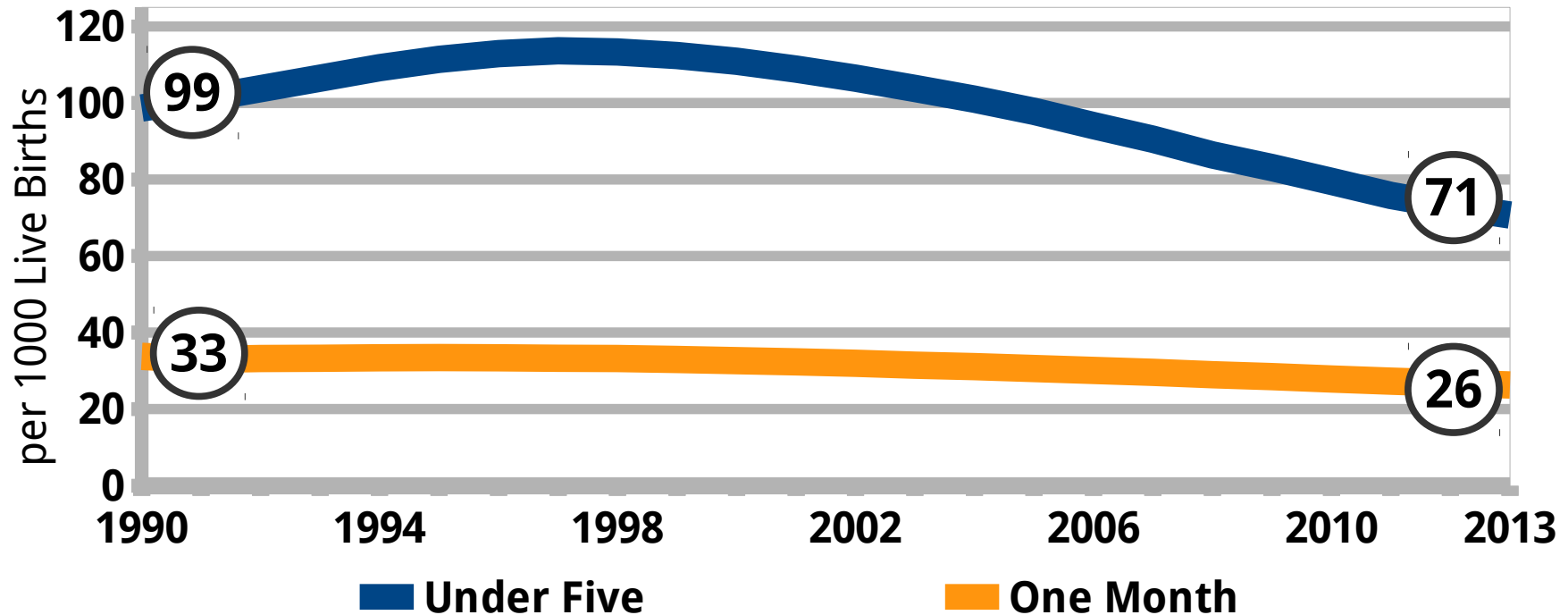
Global Focus On Maternal Health

Under 5 Child Mortality Rate



Kenya Neonatal Mortality Rate

Neonatal mortality rate has remained stagnate



Known Interventions Have Great Impact

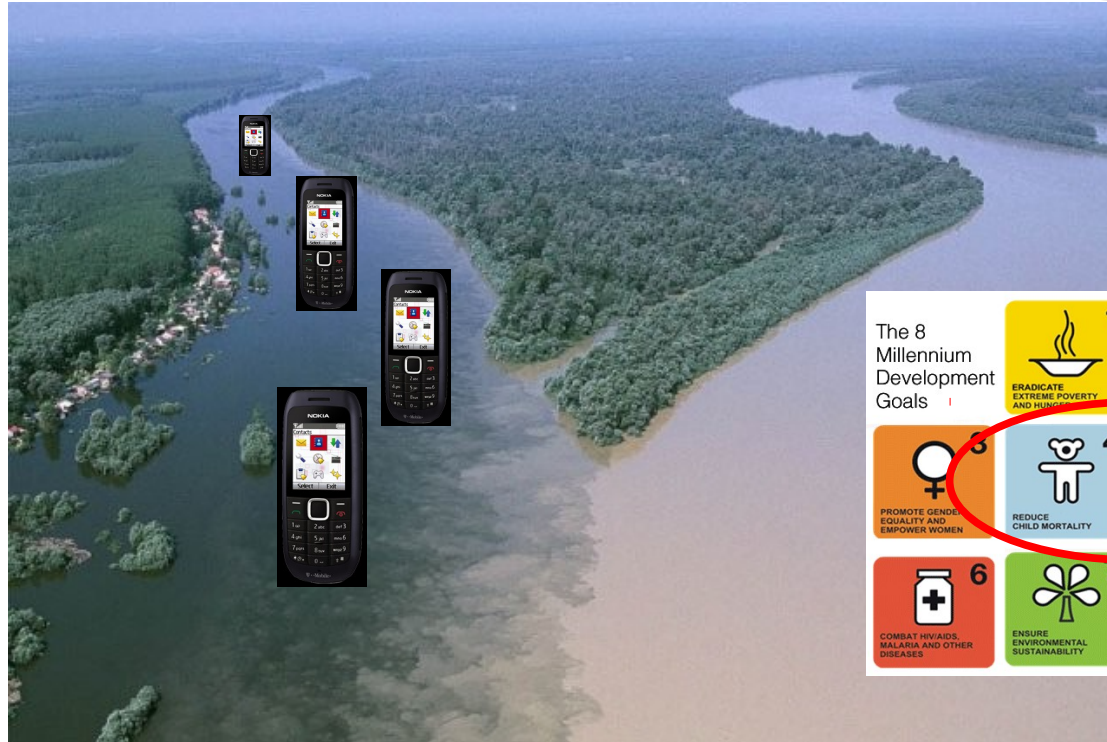
- Antenatal clinic visit
- Facility delivery
- Postnatal follow up
- Vaccination
- Contraception decision support

Engagement with health system is critical

Maternal Health in Kenya

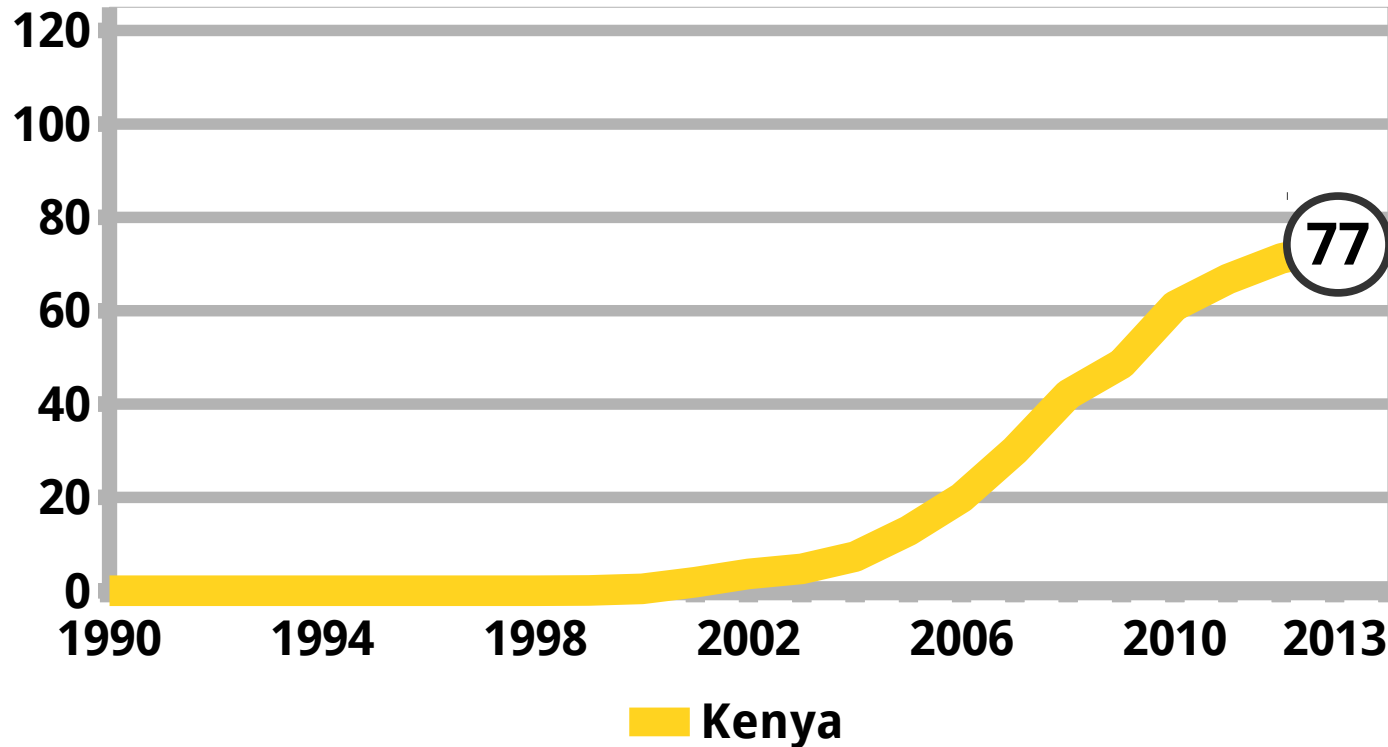
- 61% delivery in a health facility
- 51% postnatal checkup within two days.
- 53% given information about breastfeeding.

Convergence of Two Global Themes



Dramatic adoption of mobile phones

Mobile Subscriptions per 100 People




Prior Work: Two Way Messaging

Intervention Review

Mobile phone text messaging for promoting adherence to antiretroviral

Effects of a mobile phone short message service on antiretroviral treatment adherence in Kenya (WeTel Kenya1): a randomised trial

Dr [Richard T Lester](#) MD ^{a b c} , [Paul Ritvo](#) PhD ^d, [Edward J Mills](#) PhD ^e, [Antony Kariri](#) BSc ^a, [Sarah Karanja](#) BSc ^a, [Michael H Chung](#) MD ^f, [William Jack](#) DPhil ^g, [James Habyarimana](#) PhD ^h, [Mohsen Sadatsafavi](#) MD ⁱ, [Mehdi Najafzadeh](#) MSc ^j, [Carlo A Marra](#) PharmD ⁱ, [Benson Estambale](#) MBChB ^j, [Elizabeth Ngugi](#) PhD ^a, [T Blake Ball](#) PhD ^b, [Lehana Thabane](#) PhD ^k, [Lawrence J Gelmon](#) MD ^{a b}, [Joshua Kimani](#) MBChB ^{a b}, [Marta Ackers](#) MD ^l, Prof [Francis A Plummer](#) MD ^{b m}

A

David J. Finitis*, Jennifer A. Pellowski, Blair T. Johnson

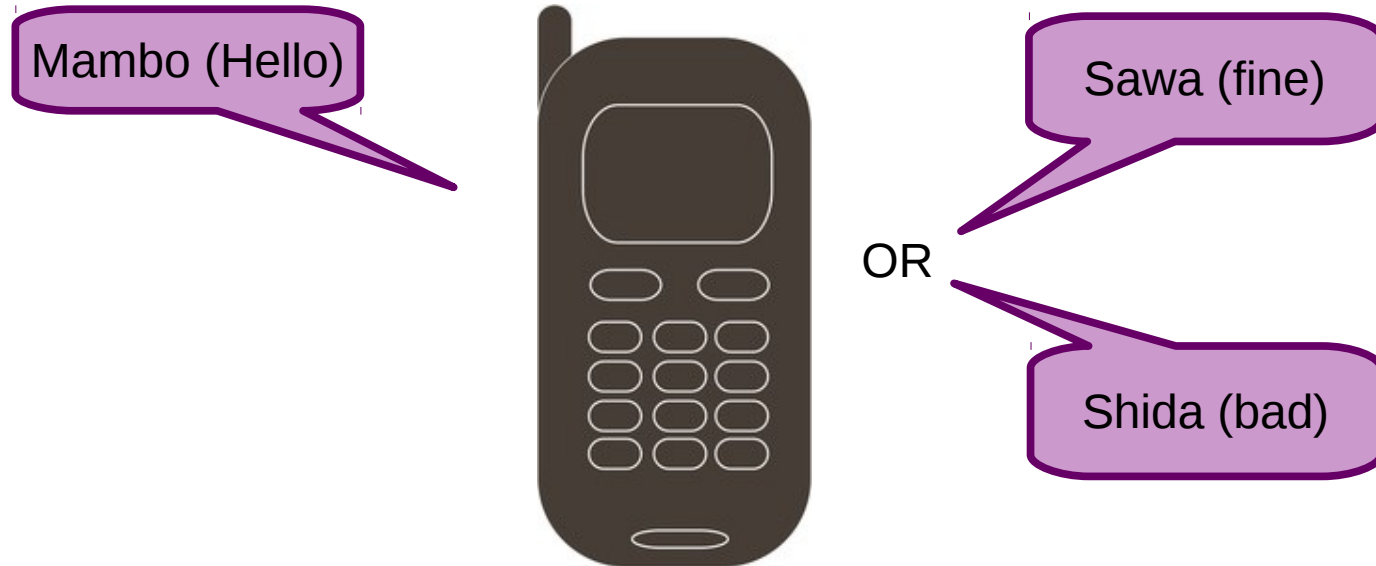
Department of Psychology, Center for Health, Intervention, & Prevention (CHIP), University of Connecticut, Storrs, Connecticut, United States of America

Department of Respiratory Medicine, Bispebjerg Hospital, Bispebjerg Bakke 23, DK-2400 Copenhagen NV, Denmark

Prior Work: Two Way Messaging

WelTel Kenya1: **Effects of a mobile phone short message service on antiretroviral treatment adherence in Kenya.** *Lester et al. The Lancet (2010)*

Simple Two-Way SMS Intervention



Research Questions

- Can two-way SMS be personalized
- Can automated two-way SMS **engage** pregnant women with the health system?
 - Will they respond?
 - What type of replies are sent?
- Can an automated two-way SMS system **adapt** to individual events and context?

How To Design For Engagement

470 preprogrammed messages

- 20 weeks prenatal, 10 weeks postpartum

**Prenatal
Week 27**

[Name], this is [Nurse] 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?**

**Postpartum
Week 8**

[Name] this is [Nurse] from clinic. Are you having trouble breastfeeding? Giving the baby other fluids can cause illness and weakness. Please continue to only give breast milk to your baby for at least six months. **How long do you plan to breastfeed?**

How To Design For Engagement

470 preprogrammed messages

- 20 weeks prenatal, 10 weeks postpartum
- English and Swahili

Week 25 ANC Message: English and Swahili

<Name>, this is Kerubo from Mathare clinic. If you have bleeding during this time in pregnancy go to the clinic right away. Have you had any bleeding?

<Name>, mimi ni Kerubo kutoka kliniki ya Mathare. Kama wewe utatokwa na damu wakati huu wa mimba nenda kliniki haraka. Je umeshawahi kutokwa na damu?

Building a Hybrid SMS System



**SMS Cloud
Management System**



**Short code
Free incoming
SMS**



Individual Context

- Language
- Preferred send time
- Expected Due Date
- Next scheduled visit

Building a Hybrid SMS System



**SMS Cloud
Management System**



**Short code
Free incoming
SMS**



[Name], this is [Nurse] 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?**

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

Group	Last SMS	Unread Messages
(#132): Carlyne	Mar 22.	1 unread messages.
(#242): Nancy	Mar 22.	1 unread messages.
(#100): Gladys	Mar 22.	1 unread messages.
(#155): Mary	Mar 21.	1 unread messages.
(#071): Jane	Mar 21.	
(#184): Stephanie	Mar 20.	
(#202): Rael	Mar 20.	
(#169): Stella	Mar 20.	
(#195): Jackline	Mar 19.	
(#248): Beatrice	Mar 19.	
(#154): Rachel	Mar 19.	
(#140): Jane	Mar 19.	



TO: RAEI (#202)

0/144 characters, 0 messages

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.
Deel this is Kerubo 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

Deployment

- 100 women registered at ANC visit.
- Eligibility Criteria:
 - Daily access to mobile phone.
 - Read/Write English or Swahili
- Only visited study nurse for non-medical study follow up.



Location and Context: Mathare North Health Center



Target Demographic: Young, poor and uneducated

Average Age: 24 years

First Time Mothers: 54%

Average Household Income: \$69/mo
(USD)

Education Level:

- Completed Primary: 68%
- Completed Secondary: 12%

Technology Use:

- Use SMS Regularly: 35%
- Used Internet: 7%
- Basic phone: 45%



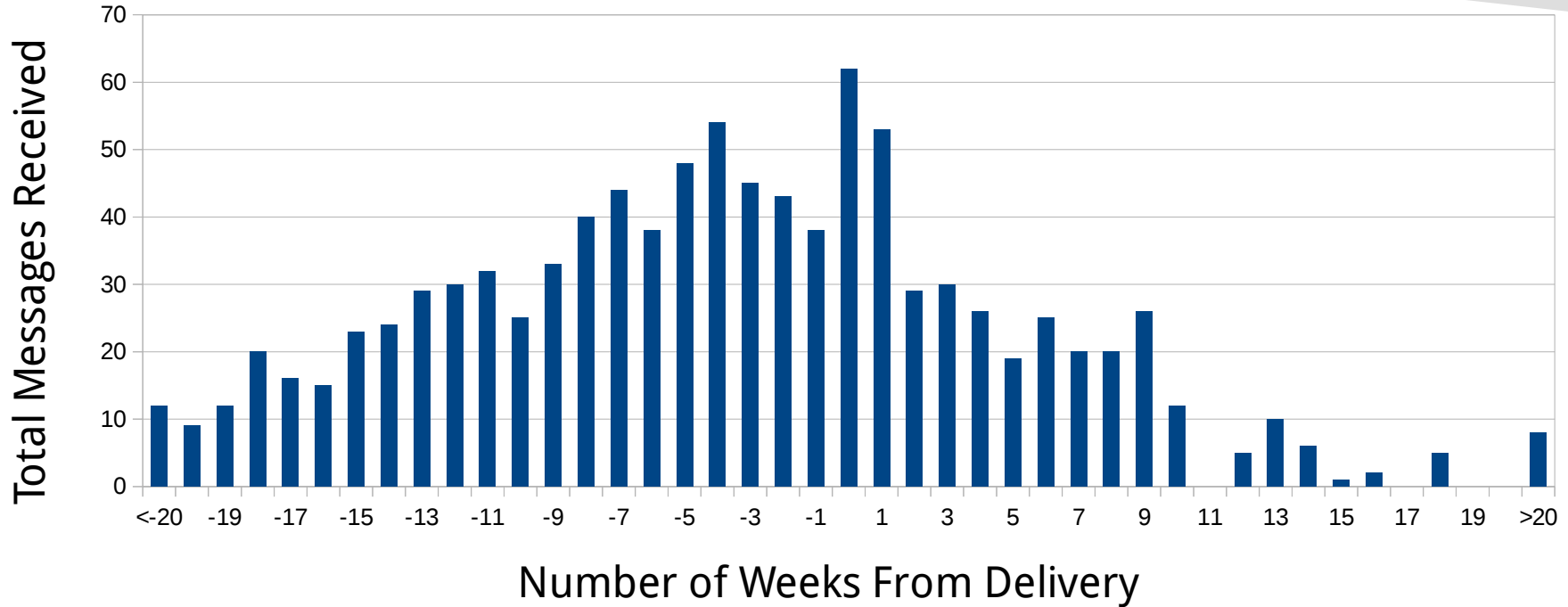
How was the system used?

Between Aug 2013 and Aug 2014

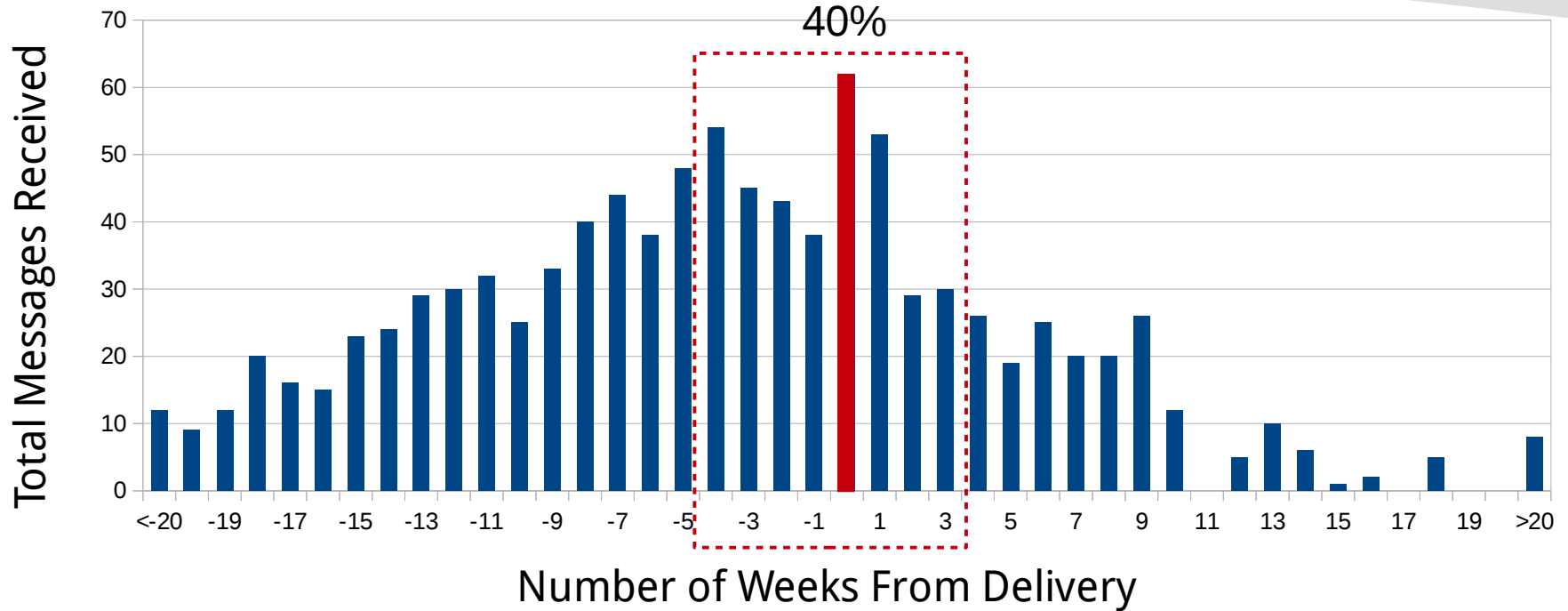
- 3661 System Messages
- 944 Participant Messages
- 423 Nurse Messages (only one nurse)

**On average each participant sent 2 messages per month
82 participants sent at least one message**

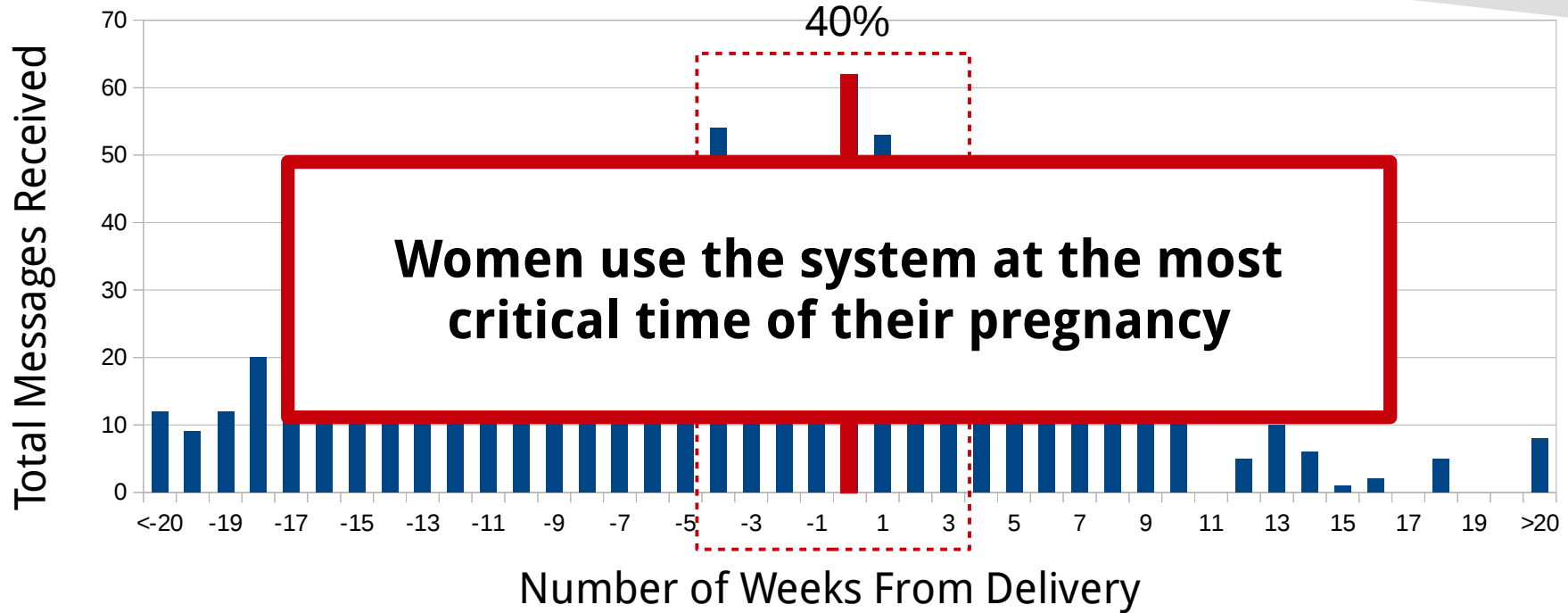
When do women respond?



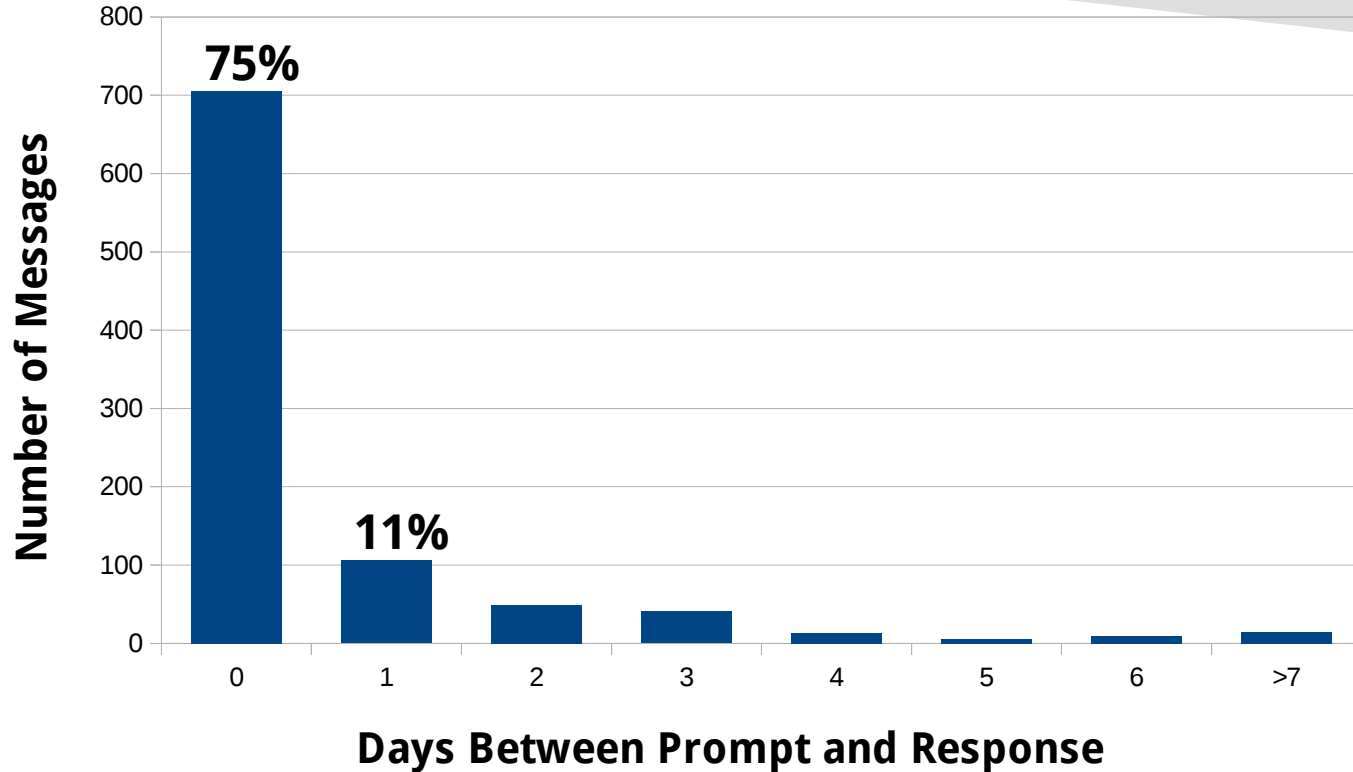
When do women respond?



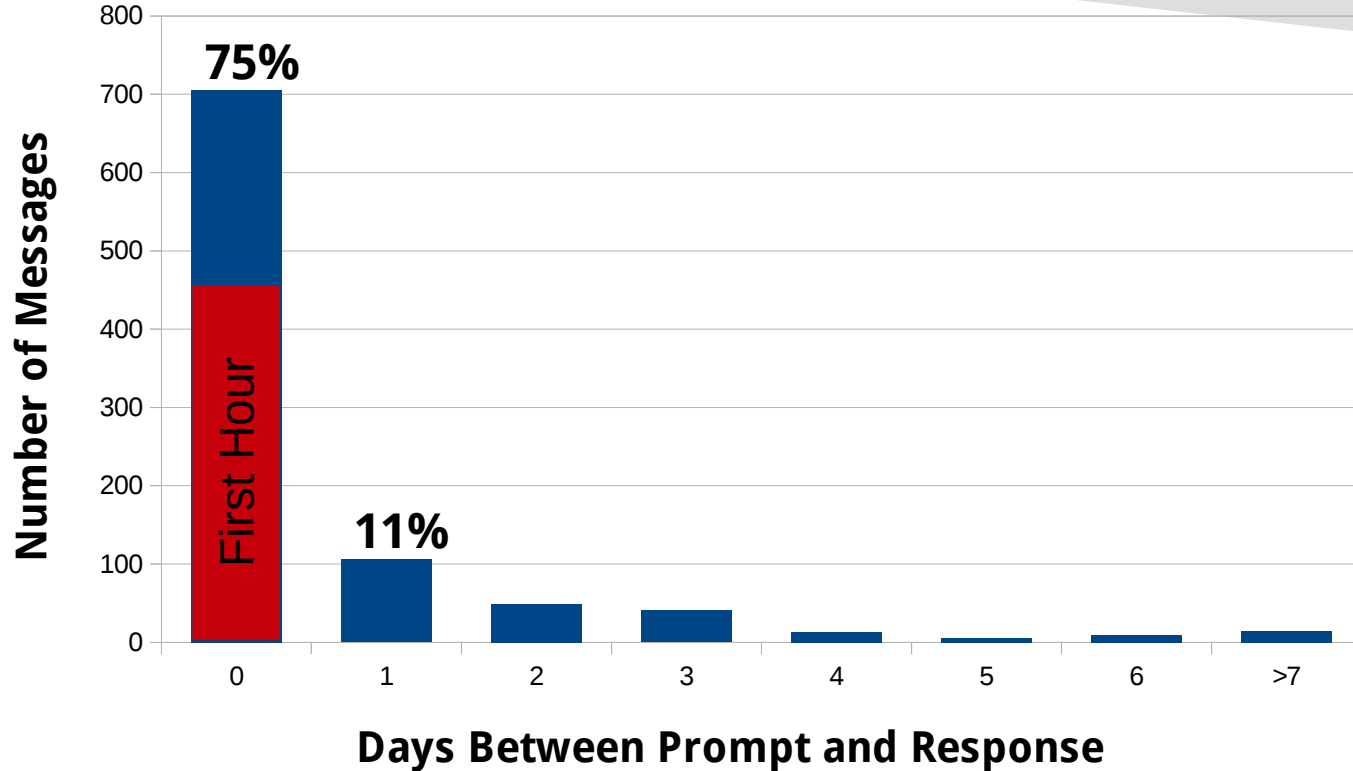
When do women respond?



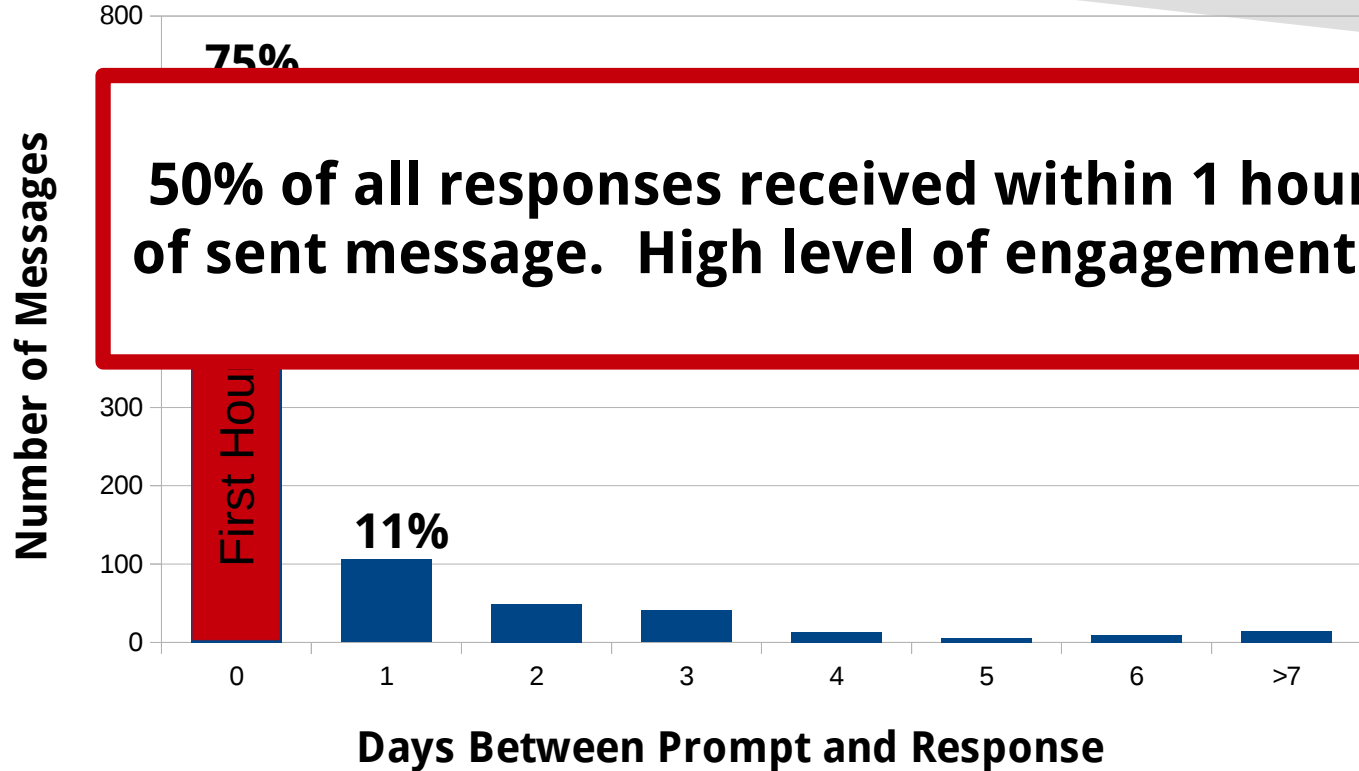
How fast do women respond?



How fast do women respond?



How fast do women respond?



What do women say?

Automated messages initiate conversations

System Message Week -4: Nov. 21 1pm

Nyambu this is Kerubo from Mathare clinic. Regular, strong stomach pains are a sign of labor. If you feel strong tightening of your belly, leaking of fluid or any bleeding go to the clinic. **Have you had any labor pains? How often do you feel them? Are you worried?**

System Message Week -4: Nov. 21 1pm

Nyambu this is Kerubo from Mathare clinic. Regular, strong stomach pains are a sign of labor. If you feel strong tightening of your belly, leaking of fluid or any bleeding go to the clinic. **Have you had any labor pains? How often do you feel them? Are you worried?**

Response: Nov. 21 1:44pm

Hi,am not as such worried,but i have a little fear.i have never had any labor pains.

strong tightening of your belly, leaking of fluid or any bleeding go to the clinic. **Have you had any labor pains? How often do you feel them? Are you worried?**

Response from Nyambu: Nov. 21 1:44pm

Hi,am not as such worried,but i have a little fear.i have never had any labor pains.

Nov. 21 1:54pm

Hi.madam [nurse], **kindly will u state for me items that are needed when i will attend clinic during labor pains** e.g clothing for the baby,basin,.and what els.....

Hi,am not as such worried,but i have a little fear.i have never had any labor pains.

Nov. 21 1:54pm

Hi.madam [Nurse], **kindly will u state for me items that are needed when i will attend clinic during labor pains** e.g clothing for the baby,basin,.and what els.....

Response from Study Nurse: Nov. 22 4:26pm

Hi [Name], you need baby clothes, shawl, lesa, basin,spirit, cotton wool. that is mainly it. the rest you can inquire from the nurses when you reach the hospital.

Hi.madam [Nurse], kindly will u state for me items that are needed when i will attend clinic during labor pains e.g clothing for the baby,basin,..and what els.....

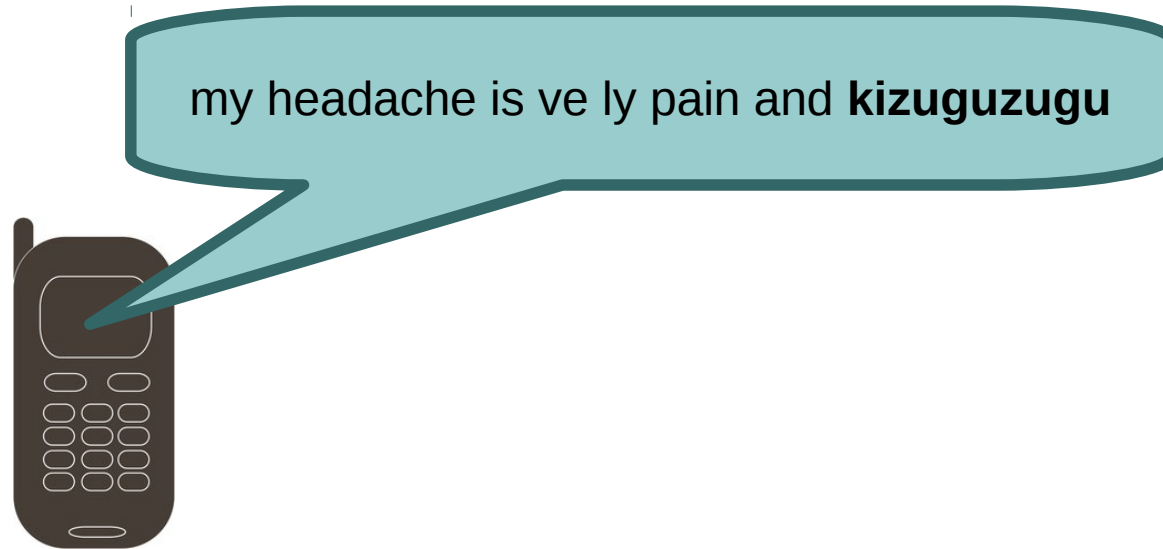
Response from Study Nurse: Nov. 22 4:26pm

Hi [Name], you need baby clothes, shawl, lesso, basin,spirit, cotton wool. that is mainly it. the rest you caninquire from the nurses when you reach the hospital.

Nov. 22 4:42pm

Hi.madam [nurse],thanks for ua informations.ua messages are really encouraging.

Language Mixing: English & Swahili



Extensive use of 'txting'

the 1st thing iwould like 2say hi 2u hpng dat ur fine.**my qstn is dat when ivisted clnc last mnth itryd 2expose my complication 2the dctr dat the lab told 2hav some medicine coz of infctn bt they gav out 2 me some amoxil capsols 4me 2use 2x3 pa day bt whn iused them 4the 1st 4day iwas flng stomach strng pain den ijust chsn my self 2surrender tkng thm did iwrng or icld cntnu usng them bcz its how they use 2cure**



Extensive use of 'txting'

the 1st thing i would like 2 say hi 2u hpng dat ur fine. **my qstn is dat when ivisted clnc** last mnth itryd 2 expose my complication 2 the dctr dat the lab told 2 hav some medicine capsols 4 4day i was 2surender bcz its how

you should have used them for 5 days. **amoxil are antibiotics which help when you have infection.** you should have another urine test and if the infection is still there you will have to take the whole dose for 5 days.



Extensive use of 'txting'

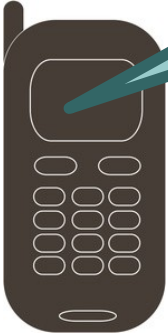
Important to keep a human in the loop

the 1st thing i would like 2 say hi 2u hpng dat ur fine. my
qstn is dat when i visted clnc last mnth itryd 2 expose
my complication 2 the dctr dat the lab told 2 hav some
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you should have used them for 5 days. **amoxil are antibiotics which help when you have infection.**
you should have another urine test and if the infection is still there you will have to take the whole dose for 5 days.



Participant Questions

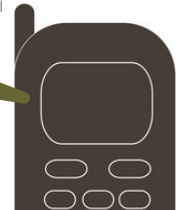
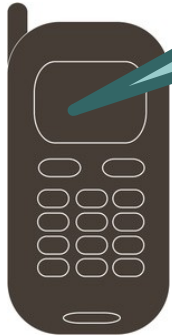


I haven't started any family planning I want to try coil .I was advised by a friend to **try herbal tablet** one per month not yet used kindly advice me this **am confused pls.**

Participant Questions

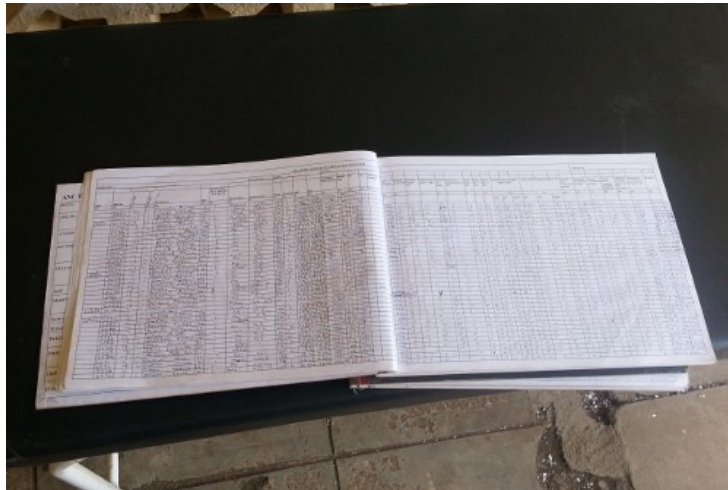
I haven't started any family planning I want

Hi [Name], i dont have a lot of information about the herbal family planning method but like any other family planning, it is not 100%effective. i can teach you about the coil. An IUD is a small, T-shaped plastic device that is wrapped in copper or contains hormones. The IUD is inserted into your uterus by your doctor.



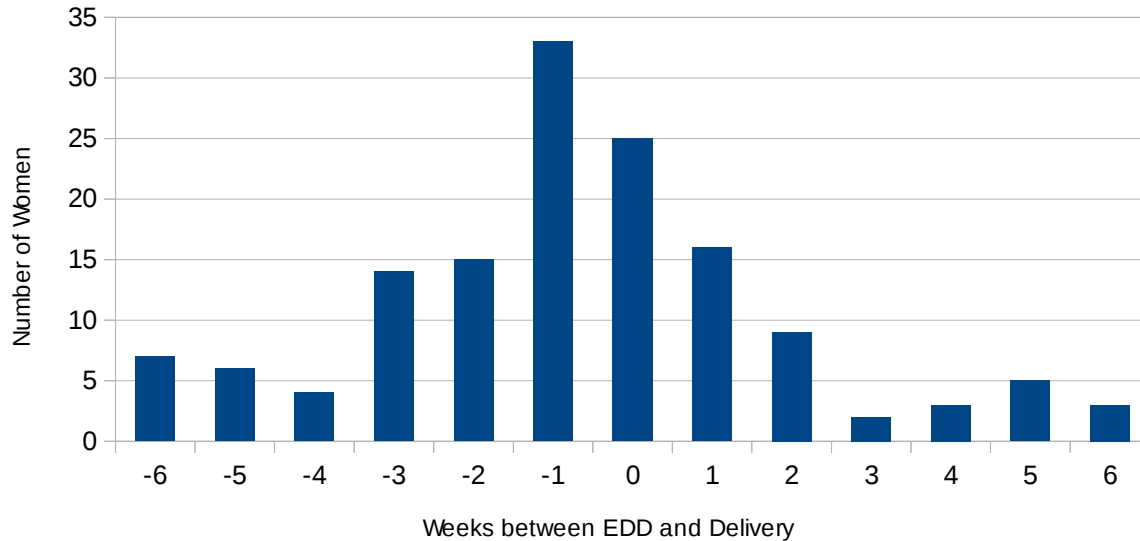
Lessons Learned

The difficulty of keeping the systems state up to date.

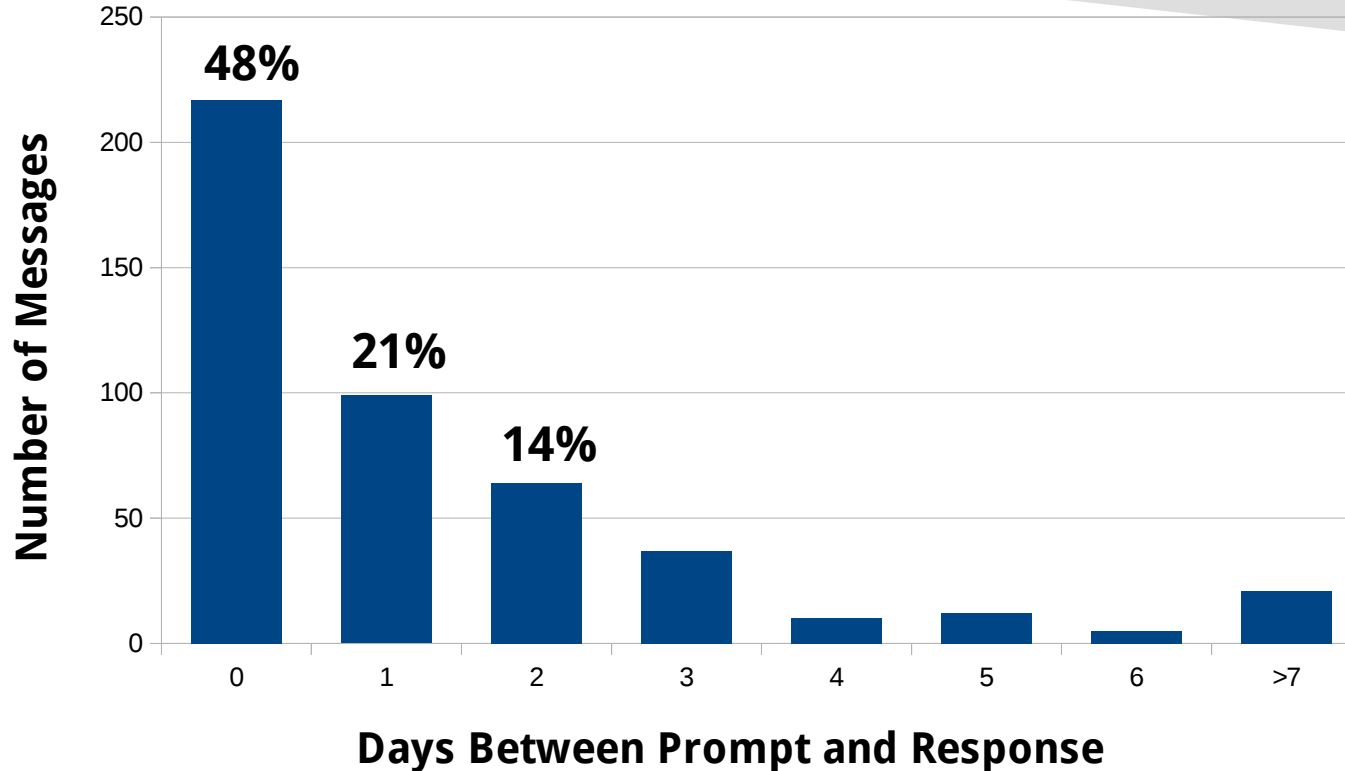


Accuracy With Dates

Expexed Delivery Date vs Actual (Weeks)




Nurse Response Time





Expansion mWaCh X: HIV+WaCh



 You have 2 new messages

 You have 2 new visits to view

 You have 4 new calls to make

 You have 2 translations to do



Home

Messages

Visits

Calls

Translations

Participants

Logout: Trevor

Ahero

Change Password



Rose Study ID: 0019 ANC #: 2016/01/12 CCC #: 10846 TWO-WAY



Send Msg



Call Log 0



Rose Untranslated 1 Mar 16 10:39

Nilikua natakakuja on 4th lakini nitakuja on that tarehe 3.

Related

Unrelated

Topic:

None

Reply

Dismiss

System Displaying original 1 Mar 16 9:00

Rose, huyu ni Penninah kutoka Ahero. Unastahili kuja kliniki siku 2 , tarehe Mar 03. Tutakuangali wewe na mwanao ili tuhakikishe mna afya bora. Unapanga kuja kliniki hii tarehe?

Nurse Displaying original 29 Feb 16 0:53

Hi Rose,am happy to learn that you are doing fine plus there are positive changes.In case you experience any challenges, please inform us through SMS.We are here because of you,thanks.



Rose Displaying original 26 Feb 16 10:34

There are changes because am able to eat well and sleep safely now,thanks for your help,thank you very much.

Reply

System Displaying original 26 Feb 16 9:00

Rose, huyu ni Penninah kutoka Ahero. Afya yako ni muhimu. Unaweza kuona mabadiliko vile unahisi. Una dalili au changamoto lolote?

Participant Details: Rose

Edit

Phone number +254716953307

Status Pregnant

Estimated Delivery Date 2016-05-19

Age 41

Send Day Friday

Send Time Evening (8 PM)

SMS Track 1 - Starting ART

ART Initiation 2016-01-05

Previous pregnancies 8

Family Planning

HIV Disclosure No

HIV Messaging No HIV Messaging

Clinic Visits and History



Date

Type

When

2016-02-03 Clinic Visit 1d

Privacy in mHealth



Connecting pregnant women to medical professionals through SMS.

Mother's responded with sensitive medical information

- Domestic violence and abuse
- Personal medical issues
- HIV and other STD's

Privacy in mHealth

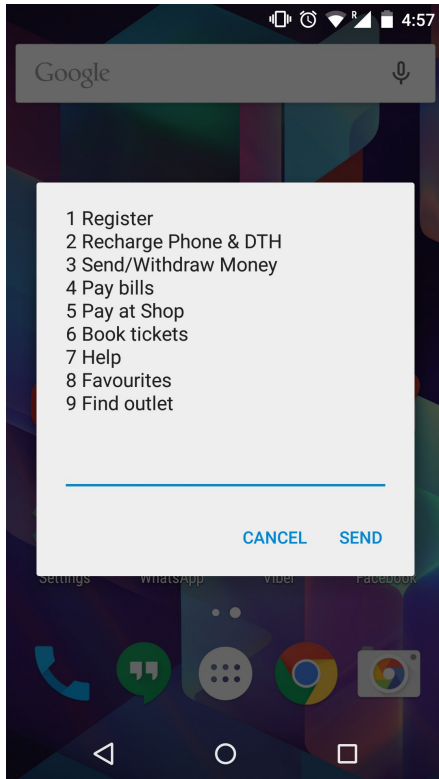
Connecting pregnant women to medical professionals through SMS.

How can we provide privacy for mHealth programs?

- Domestic violence and abuse
- Personal medical issues
- HIV and other STD's



USSD is used by large companies



- Mobile Operators
 - Manage Pre-paid accounts
 - Share airtime and data
- Banks
 - By airtime
 - Transfer money
 - Pay bills
- Other services
 - Google
 - Facebook

Why small projects use SMS and IVR

USSD has required working directly with mobile operators This means it is only feasible at scale and for large commercial projects.

“It took me nine months to negotiate with Safaricom for a USSD code”

- Samuel Gikandi

CEO Africa's Talking

Why is USSD feasible now?

Third party gateways are doing the work to partner with operators and providing more open APIs

The image shows a screenshot of the Africa's Talking website. The header includes the logo "AFRICA'S TALKING communication solutions" and navigation links for "PRODUCTS", "API & DOCS", and "CONTACT US". There are also buttons for "REGISTER" and "MY ACCOUNT". The main content area features the text "Powerful mobile communication APIs".

Overlaid on the left is a red circular graphic containing a map of Africa. A white box with a black border is positioned over the map, listing services available in Kenya: "USSD available by request" and "SMS SHORT CODES available by request".

On the right, the text "Panacea Mobile" is written in large yellow font. Below it is a diagram illustrating the API ecosystem. A central green cloud icon with three gears is labeled "Africa's Talking APIs". To its left, a server rack icon represents an "Application". A "REST Request (SMS/USSD/VOICE)" arrow points from the Application to the APIs, and an "HTTP POST Response (SMS/USSD/VOICE)" arrow points from the APIs back to the Application. To the right of the APIs, a smartphone icon represents a "User". Arrows indicate "Two-Way SMS", "USSD Sessions", and "Voice Calls" between the APIs and the User.

Video Example running on Africa's Talking

Convert KSH to USD



Code can be dialed directly without accessing menus.

NOKIA

Full  09:01

Service reply

Simple USSD Test

1. Guess A Number
2. Convert KSH
3. Random Swahili Words
4. My Phone

Answer Exit

USSD is a relative unexplored universal application expanding the design space across multiple domains.

Multiple third party service providers are offering USSD accesses making it reasonable for small projects to explore.

We have built a USSD library making it easy to do rapid development basic applications and are looking for opportunities for future deployments

Questions and Comments

- Mathare North Health Center
- University of Washington
 - Richard Anderson
 - Brian DeRenzi
 - Jennifer Unger
 - Grace-John Stewart
- University of Nairobi/
Kenyatta National Hospital
 - Dyphna Magaka
 - John Kinuthia
 - Daniel Matemo

