

Real talk: Rigorous evaluations of client side interventions are HARD.

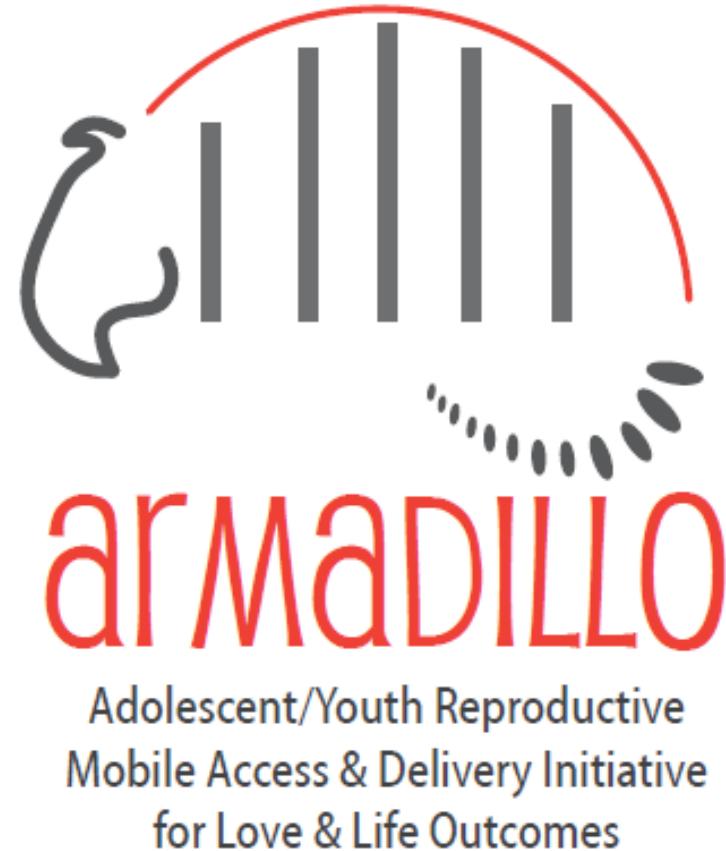
Lessons-learned from WHO's youth-targeted ARMADILLO Study

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Background: why ARMADILLO?

- There is a lack of rigorous evidence available for what works in digital for youth
 - This is especially evident in LMICs
- In response, WHO initiated the ARMADILLO Study



Background: ARMADILLO objectives

1. To develop an SMS intervention tailored for and vetted by youth (Stage I – formative phase)
 - On-demand, menu-driven, free
2. To evaluate the effect of this SMS-based intervention on SRH outcomes using a rigorous study design (Stage II – RCT)

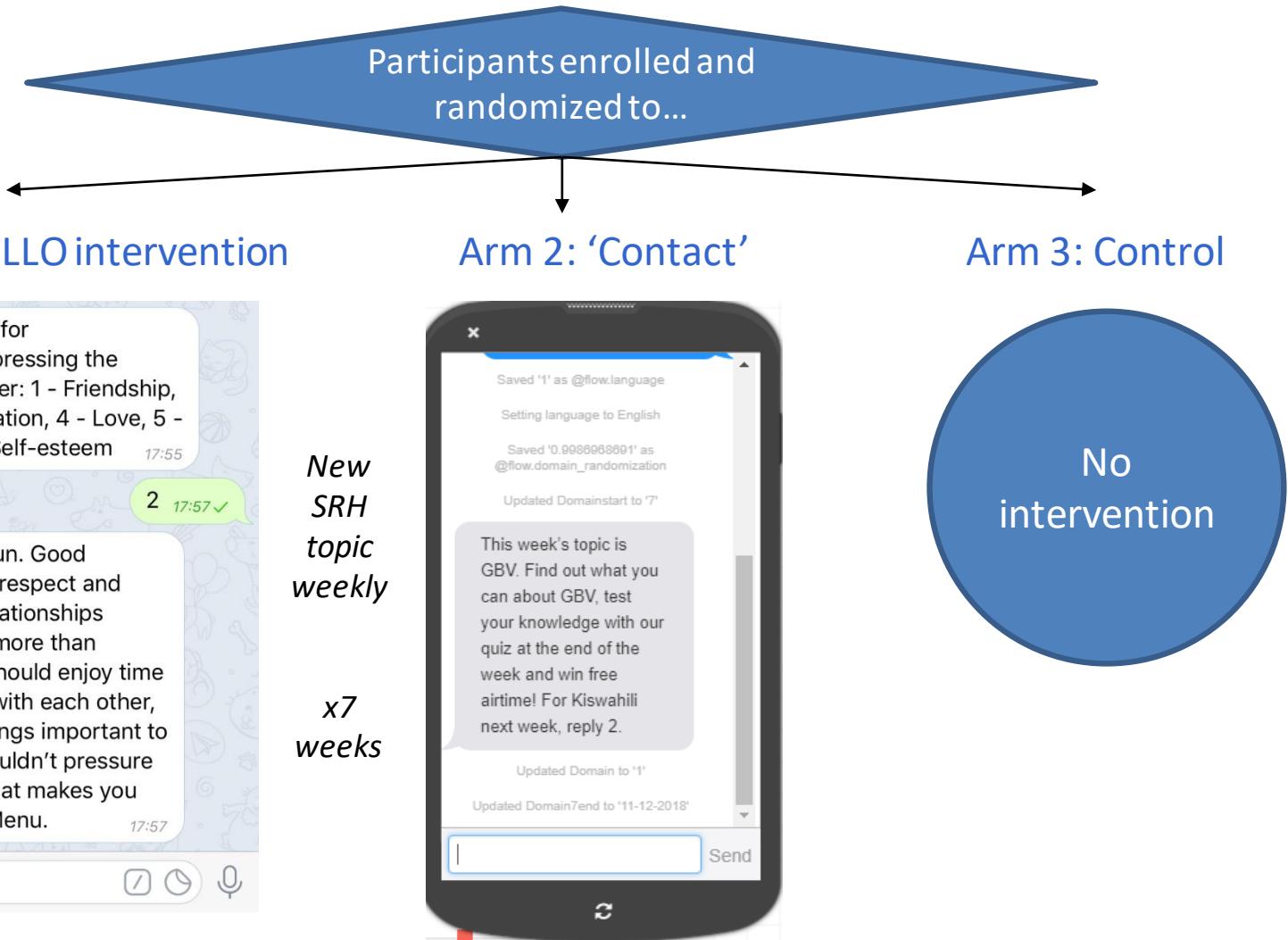
Conducted in two sites:

Lima, Peru (youth aged 13-17)

Kwale County, Kenya (youth aged 18-24)

KENYA SITE: STUDY OVERVIEW

Kenya study arms



Two implementation decisions and their consequences

WHERE WE STARTED TO GO WRONG...

Decision 1: ‘Hands-off’ recruitment process

1. Confirm young person's identity
 2. Determine eligibility to participate
 - Does youth own phone?
 - Ask to see phone
 - Enter phone number
 3. Consent participant
 - Three arms described here
 4. Complete baseline survey

Why? Familiar intervention format, didn't want to disappoint participants

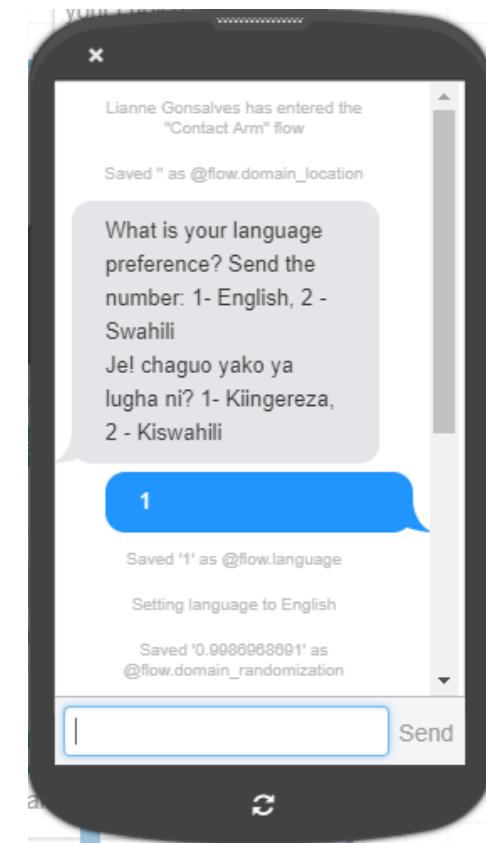


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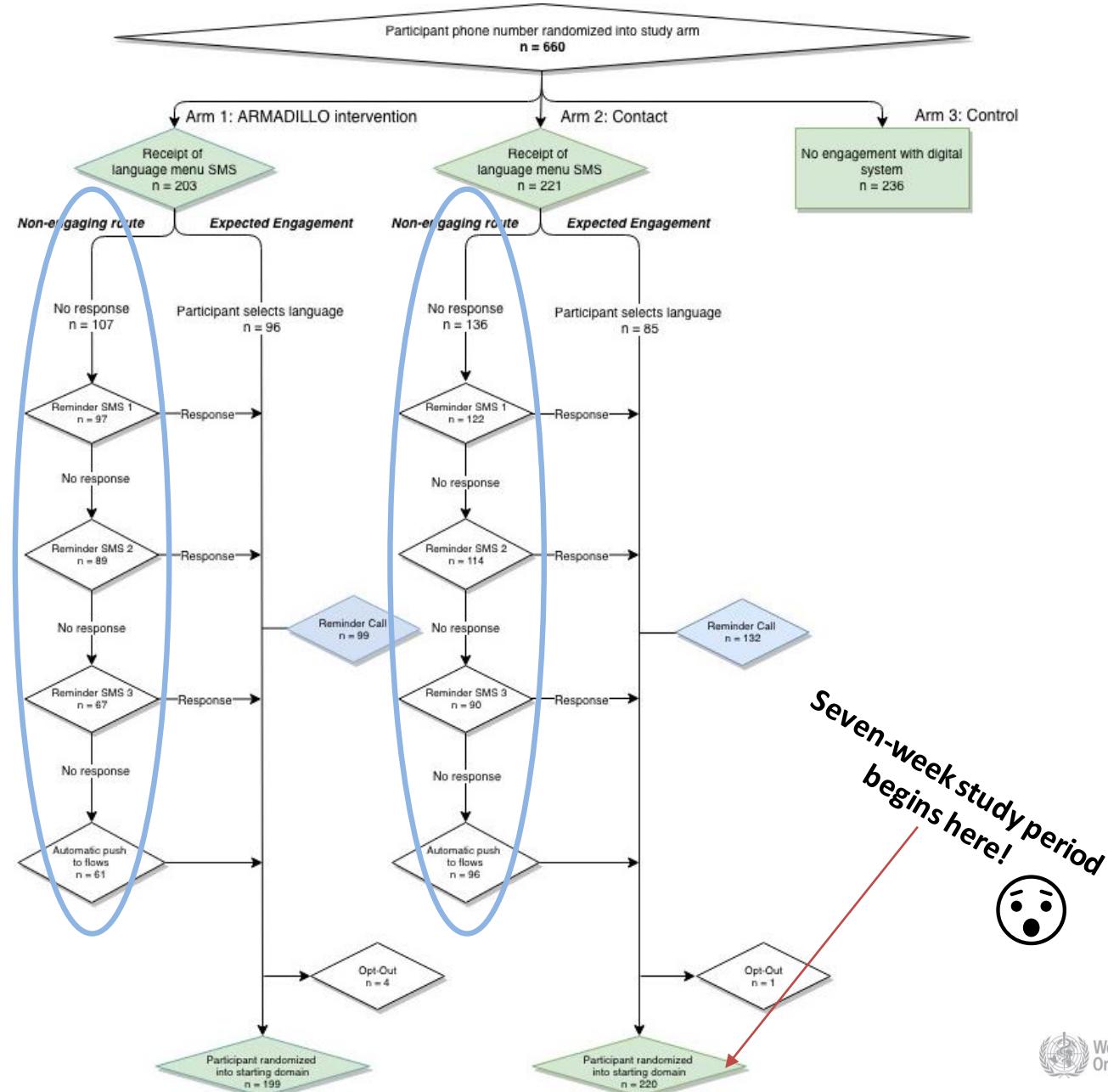
Decision 2: Language selection snafu

Issue: no clear preference for Swahili vs English in the study site. Therefore...

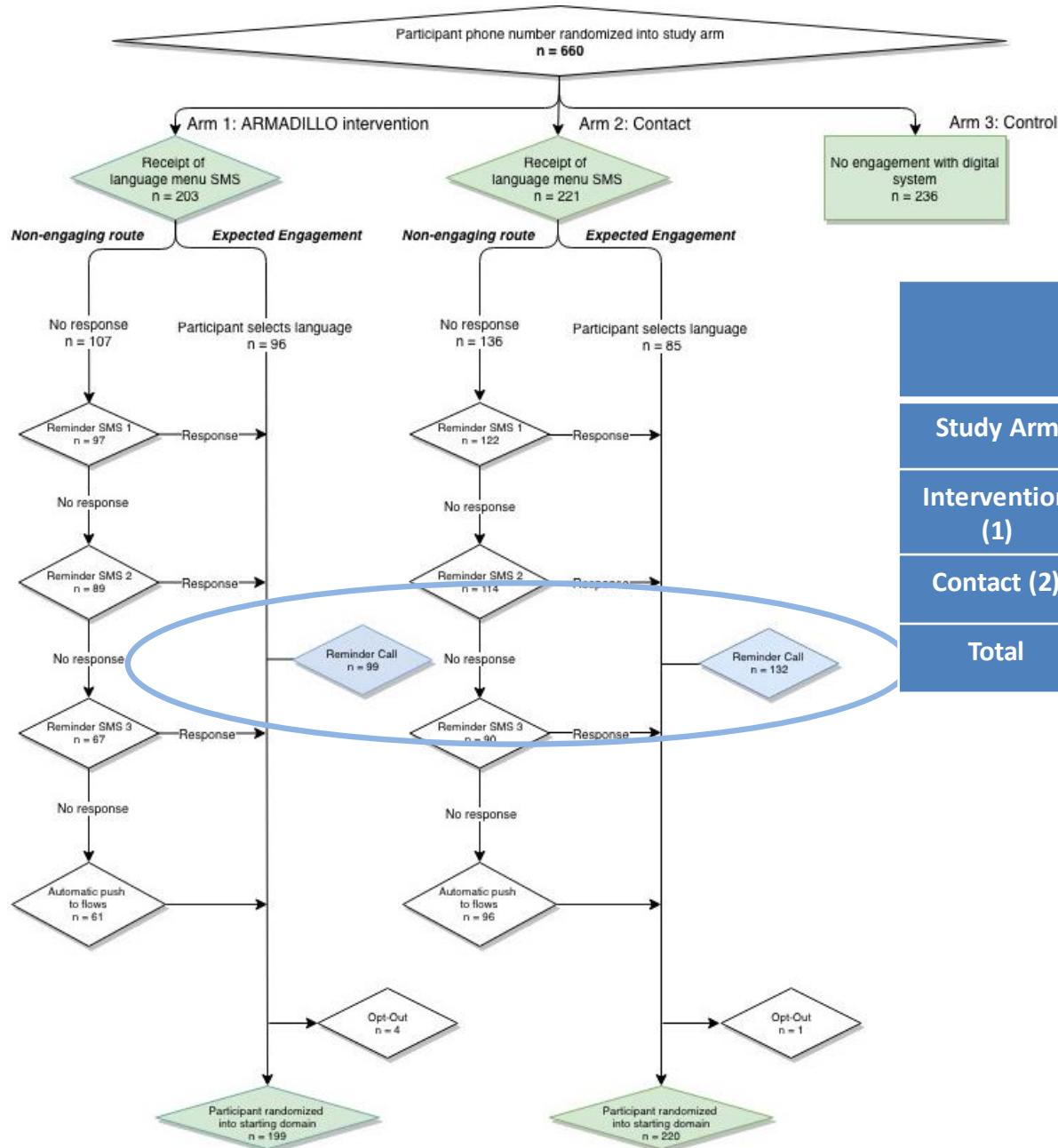
- After being randomized, and prior to receipt of first domain...
- ...Participants were sent an introductory language selection menu
- With their response, they received their first ‘intervention’ or ‘contact’ domain in their preferred language
- No response? *No study period start!*



The result. 'Stuck' participants



A chance to check in with participants



	Reached participant	Did not reach participant	Total non-engaging participants
Study Arm			
Intervention (1)	59	40	99
Contact (2)	77	55	132
Total	136(59%)	95	231

Reported for non-response to language menu

Reason for non-engagement	Intervention Arm (1) N=59 n(%)	Contact Arm (2) N=77 n(%)	Total N=136 n(%)
Eligibility-violation	15(25.4)	17(22.1)	32(23.5)
Assumed scam/spam	8(13.6)	22(28.6)	30(22.1)
Confusion	17(28.8)	10(13.0)	27(19.9)
Apathy	6(10.2)	5(6.5)	11(8.1)
Technical difficulties	9(15.3)	15(19.5)	24(17.6)
Other	4(6.7)	8(10.4)	13(9.5)

1. Have meticulous ‘phone data collection’ protocols
2. In efficacy assessments, train participants on the digital interventions
3. Client-side digital health interventions have analog discontinuation challenges

WHAT DOES THIS TEACH US? RESEARCH LESSONS LEARNED

1. Develop *phone data collection protocols*



Problem:

- We ended up with numbers that did not belong to our participants
- Reduces statistical power in analyses

Lesson:

Have data collector procedures to check and cross-check phone numbers and eligibility criteria

2. Train participants on the intervention

Problem:

- ❑ Participants were confused by ARMADILLO, *despite* its menu-based system being very close to MPESA

Lesson:

Efficacy (aka ‘ideal-research-setting’) evaluations should fully train participants on how to use the system

Save the ‘usability’ test for piloting and/or effectiveness studies

3. Factor phone-related discontinuation into sample size calculations

Problem:

- ❑ Participants' phones are helpful to track them down at endline – they are also a source of study discontinuation

Lesson:

Factor phone-related discontinuation challenges in calculating sample size

1. ‘Phone ownership’ is a fluid concept
2. Digital health campaigns should establish a credible presence
3. Interest in a service can be sporadic and/or fleeting

WHAT DOES THIS TEACH US? SERVICE ROLLOUT LESSONS LEARNED

1. Phone ownership is a fluid concept

(And we desperately need better data as to what that means)

Lesson:

- ❑ Consider whether intervention requires phone *ownership* or phone *access* and
 - What those mean
 - Whether choosing one over the other makes engagement with users more effective, acceptable, equitable, and safe.

2. Digital health interventions should establish a credible presence

Lesson:

- Participants are overwhelmed with a variety of third-party messaging – of varying quality/credibility
 - And, in many settings: phone users have are wary of potential spam/scams
- Building a credible, visible presence is critical
 - Credibility should be among both intended users and the community at large

3. Interest in a digital health service can be sporadic and/or fleeting

Lesson:

- People are not waiting around by their phones for us to message them.
- User interest and bandwidth to engage will wax and wane over a campaign



Thank you!



The rest of the ARMADILLO Kenya team:
Jefferson Mwaisaka (ICRHK)
Winnie Wangari (ICRHK)
Prof. Peter Gichangi (ICRHK – PI)
Megan Schroeder (Ona)
Lale Say (WHO)



Role of personalized digital health intervention in improving routine immunization among Pakistani children - *Paigham e Sehat*

Principal Investigator:

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- PhD (Candidate), Department of experimental medicine, University of British Columbia, Canada

Coinvestigators:

Dr. JP Collet , University of British Columbia

Dr. William McKelin, University of British Columbia

Dr. Asad Ali , The Aga Khan University



Routine Immunization

Routine immunization (RI) among children is one of the most successful and cost-effective public health intervention



- Globally

Estimated 1.5 million children still die due to vaccine preventable diseases each year

Measles outbreaks,
Polio epidemic and
High vaccination drop out



Pakistan ranks 4th in child mortality

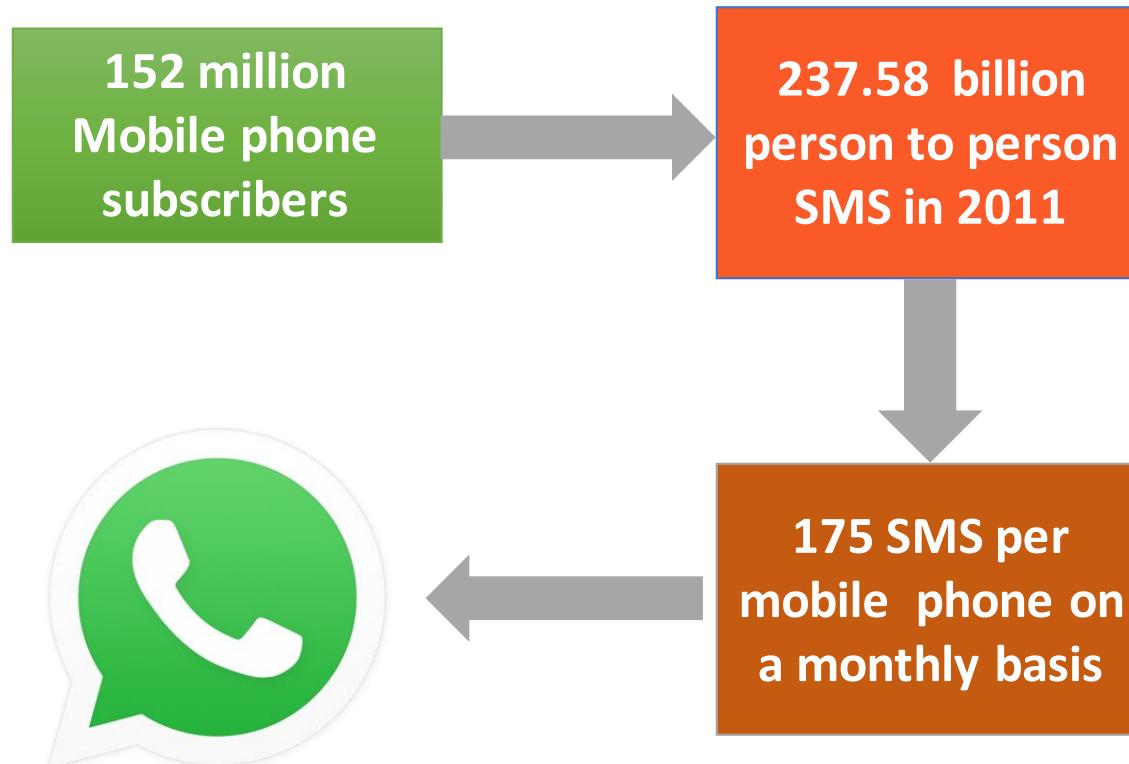
60% of all deaths are due to infectious diseases and many of them are vaccine preventable

Routine immunization coverage is estimated to be 59% at one year of age

Sindh and Baluchistan provinces being lowest with rates of 29% and 16% respectively

Mobile Phone and SMS Text

Similar to rest of the region Pakistan has also seen a global leap frog in Mobile phone usage



However less than 1/3 of the population use Smart phone and hence Interventions that can be used in simple function phone is recommended for generalizability

Study Objectives

Whether low cost, automated SMS messages and calls
Improve RI coverage in resource constrained settings
like Pakistan?

**Identify possible barriers
and factors related to
vaccine uptake and
adherence**

Compare the effectiveness of different types of
messages

**Develop personalized
messages according to the
caregivers/family
preferences**

Reminder

Educational and

**To improve vaccine
coverage and timelines**

Interactive

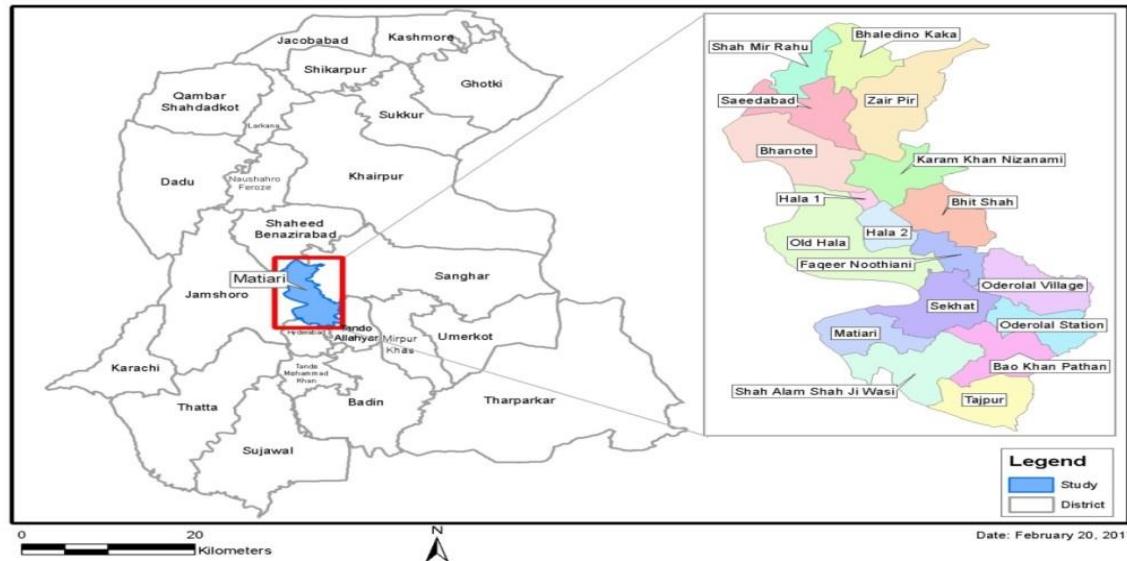
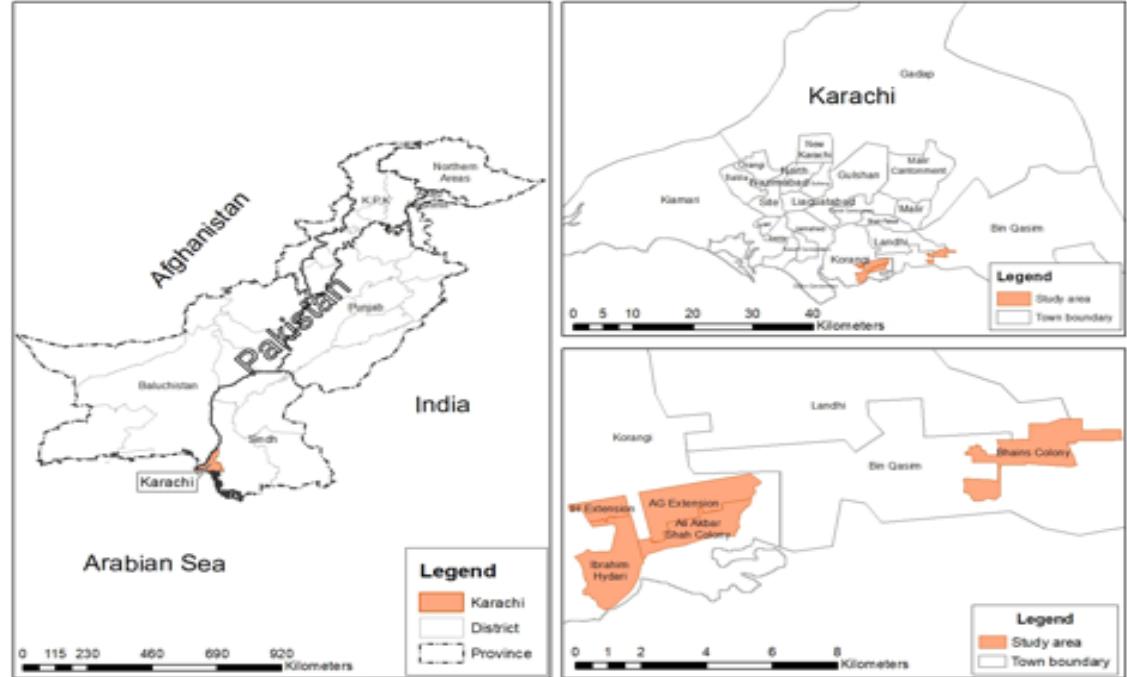
Study Sites

Urban Site

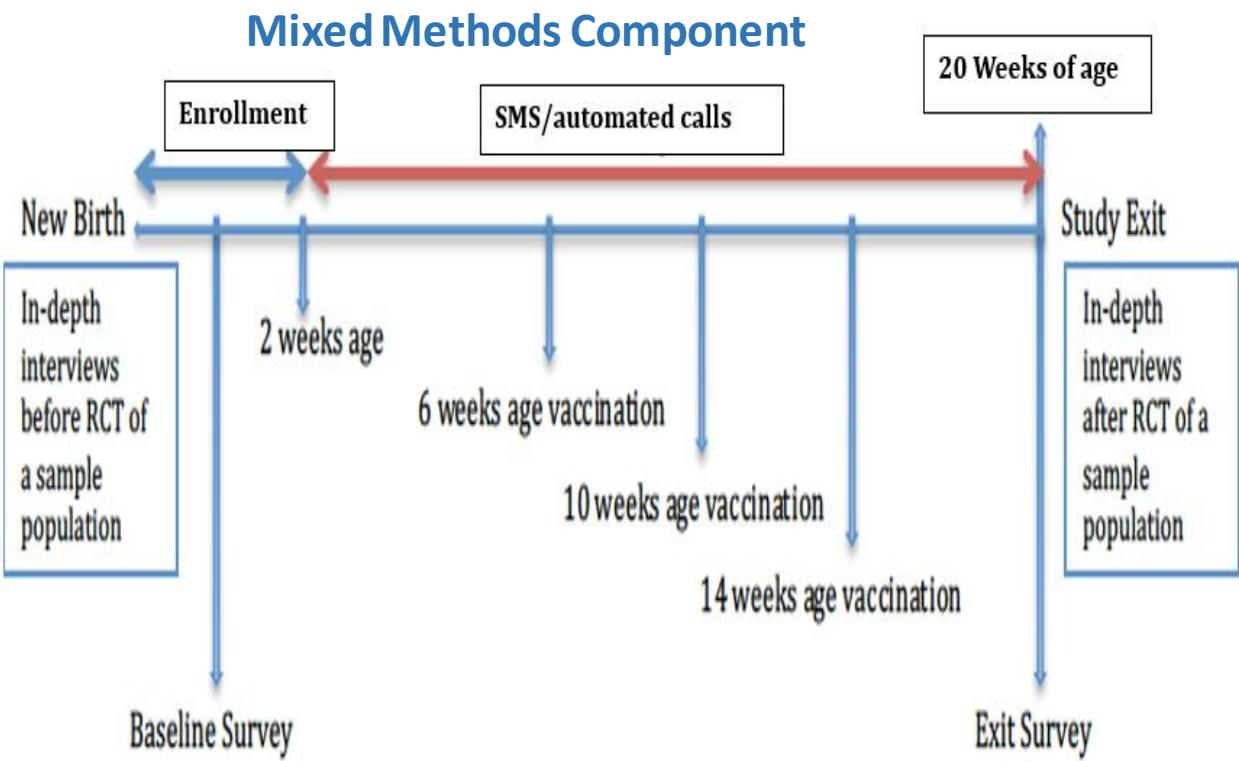
Health Demographic surveillance system (HDSS) at peri urban site in Karachi

Rural site

Matiari district of Sindh province located north of Karachi



Study Methodology



Qualitative component

- **Before the trial**
 - I. Types of barriers perceived by caregivers,
 - II. Designing the RCT and,
 - III. Developing content for messages in several categories of barriers

Qualitative component

- The **baseline survey** a collect information on
 - Basic demographics
 - Mobile phone accessibility and usage, and
 - Factors associated with mobile health messages

Intervention

- **After trial**
- Explore factors associated with vaccine uptake
- According to study arm

- A survey at the **end of the study** will be conducted to collect details
 - Vaccine uptake and
 - Timelines according to the schedule

Key In depth Interviews Findings

Barriers to RI Coverage

- Forget RI due date
- Lack of awareness for immunization
- Not permitted by family members
- Low level of trust for government EPI
- Religious beliefs
- Adverse effects

Messages

- Preferred language for SMS
 - Roman Urdu and plain Urdu for urban site
 - Sindhi written in Sindhi script for rural site
- Preferred language for automated calls
 - Urdu for urban site and
 - Sindhi for rural site

Development of Study Intervention

1. Literature search through Published Articles, Reports and Gray material for the creation and compilation of content according to categories



2. In-depth Interviews (IDIs) for exploration and content validation



3. Content Development for automated SMS and Call in English and Local Languages and back translated



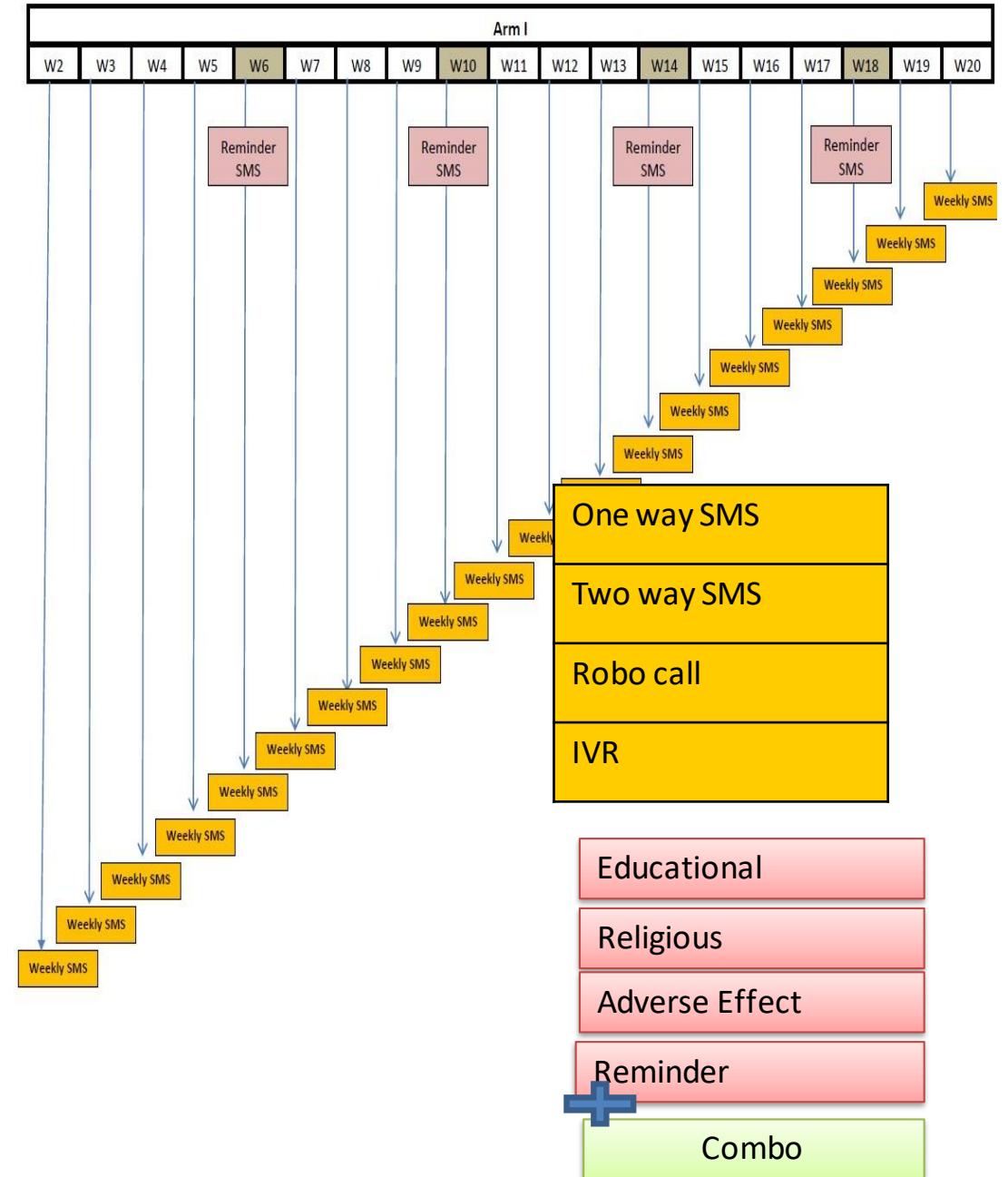
4. Stake holders meeting to finalize the content and include Health Experts, Research Experts and Technology Experts



5. Focused Group Discussion (FGD) on the final content with caregivers to explore their understand



Personalized content



English	Roman Urdu	Urdu	Roman Sindhi	Sindhi
AKU (Paigham e Sehat) Get your child vaccinated on time for 10 dangerous diseases like TB, Diphtheria, Pertussis, Measles, pertussis, Measles, tetanus, hepatitis, meningitis, Pneumonia, diarrhea and polio.	AKU (Paigham e Sehat) Apne bacho ko 10 khatarnak beemariyo TB, Khanaq, kali khansi, khasra, tashanuj, yarqan, gurdun tor bukhar, pneumonia, dast or polio k hifazati teekay wakt per lagwae	ای. حکی. یو (بیغام صحت) اینے بجوں کو 10 خطرناک بیماریوں ، خناق، کالی TB، کھانسی، خسرہ، تشننج، برقاد، گردن توڑ بخار، نمونیہ، دست اور یولیو کے حفاظتی ٹیکے وقت لگوانیں	AKU (Pegham e sehat) Panhanje baran khay 10 khatarnak beemariyan T.B, khanaq, kari khangah, tashanuj, kari yarqan, gardan tor bukhar, pneumonia, dast ain polio ja hifazati teeka waqt tay lagayo	ای. حکی. یو (بیغام صحت) یو . حکی. ای یعنیجی بار کی پی. خطرناک بیماریاں تی 10 خناق، سکاری گنگہ، جہنمکا، سانی، گردن توڑ بخار، نمونیا، دست ٹپ یولیو جا حفاظتی تھا وقت تی لگائیو
AKU (Paigham e Sehat) Vaccines are available worldwide. Vaccination is mandatory for Hajj and Umrah pilgrims.	AKU (Paigham e Sehat) Dunya k tamam mulko mai hifazati teekay muhya hain Hajj or Umrah par jane wale afrad ko hifazati teekay lagwana lazim hai	(بیغام صحت) دنیا کے تمام ملکوں میں حفاظتی ٹیکے مہیا ہیں حج اور عمرہ پر جانے افراد کو حفاظتی ٹیکے لگوانا لازمی ہے	AKU (Pegham e sehat). Dunya jay sabhni mulkan mai hifazati teeka mohya ahin, hajj ain umrah tay wiyan waran mahran khay hifazati teeka lagayan lazmi ahin	ای. حکی. یو (بیغام صحت) دنیا جی تمام ملکوں ج حفاظتی تھکا مہیا آهن، حج ۽ عمری تی وجہ وارن ماڻهن کی حفاظتی تھکا لڳائڻ لازمی آهن
AKU (Paigham e Sehat) Its common to have pain and inflammation at the site of injection or to have fever or diarrhea. These are timely symptoms. For high fever and seizures please consult doctor	Teekay ki jaga per dard, sujan, bukhar, dast hona aam baat hai Yeh wakti asraat hain is k elawa shaded bukhar ya jhatkay k lye doctor se ruju kren	(بیغام صحت) ٹیکے کی جگہ یہ درد، سوچ، بخار، دست بونا عام بات ہے یہ وقتو اترات ہیں اس کے علاوہ شدید بخار یا جھٹکے کے لئے ڈاکٹر سے رجوع کریں	AKU (Pegham e sehat). Teekay ji jay tay sur, sujhan, bukhar ain dast thian aam ghal ahay, ihi wakti asraat ahin, in jay elawa shadeed bukhar ya jhatkan jay laye doctor san ruju kary	ای. حکی. یو(بیغام صحت) تھکی جی جاء تی سور، سوچ، بخار، دست تیئن عام گالہے آهي، اهي وقتو اترات آهن، ان کان علاوه شدید بخار یا جھٹکن جي لاء داڪٽر سان رجوع ڪريو

KU (Paigham e Sehat) Apne bacho ko 10

khataranak deemanyo TB, Khanaq, kali khansi, hasra, tashanuj, yarqan, gurdun tor bukhar, pneumonia, dast or polio k hifazati teekay vakt per lagwae.Teko ki tadaat ky ly 1 aur eko ki ehmiyat ky ly 2 likh kr reply krein

Two Way Audio

1

2

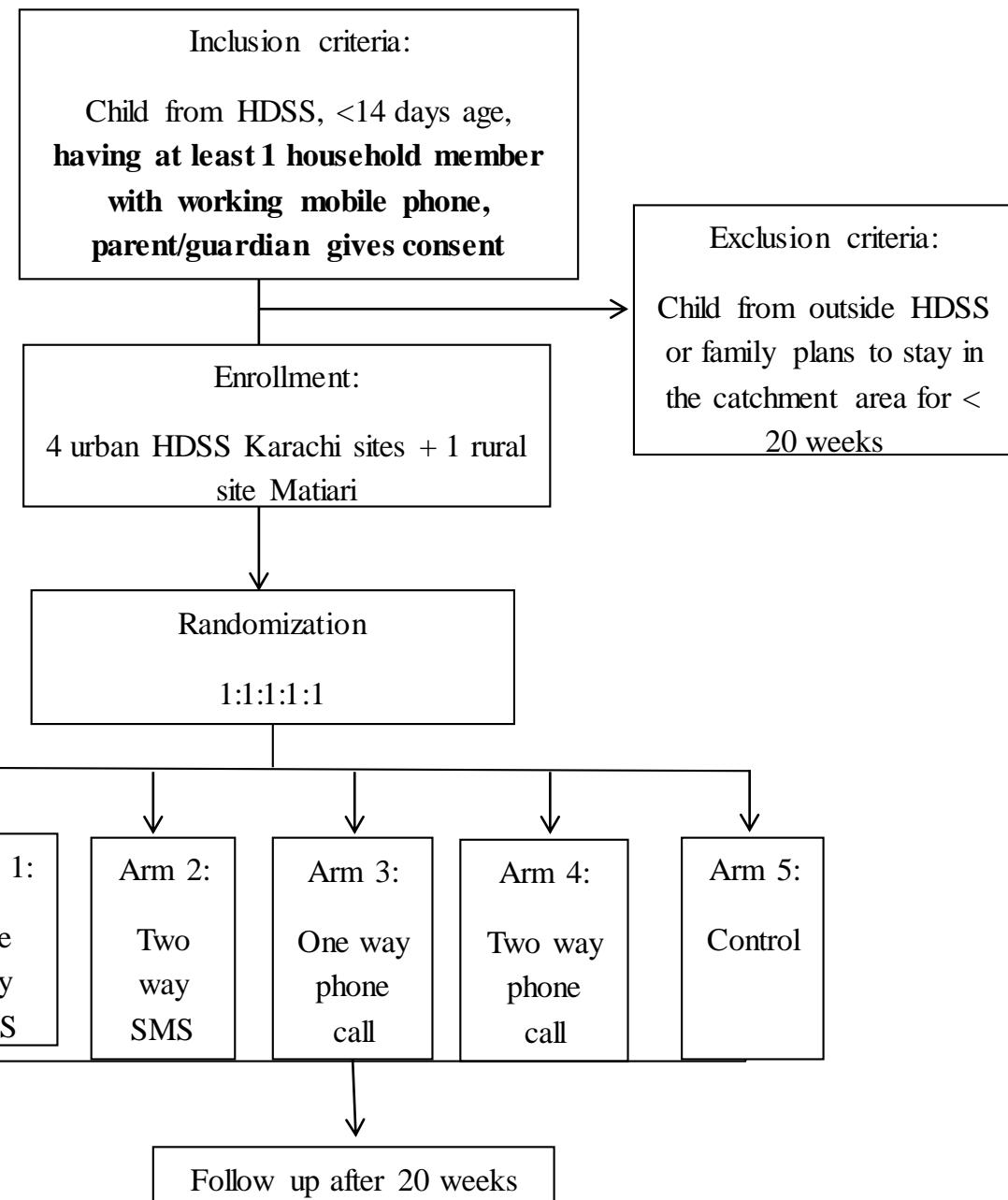
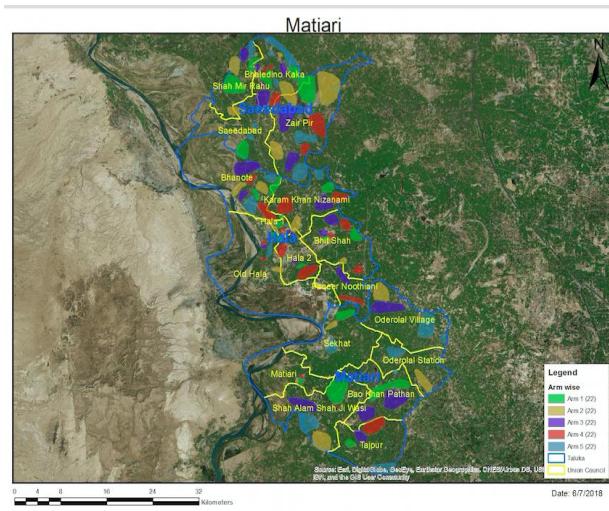
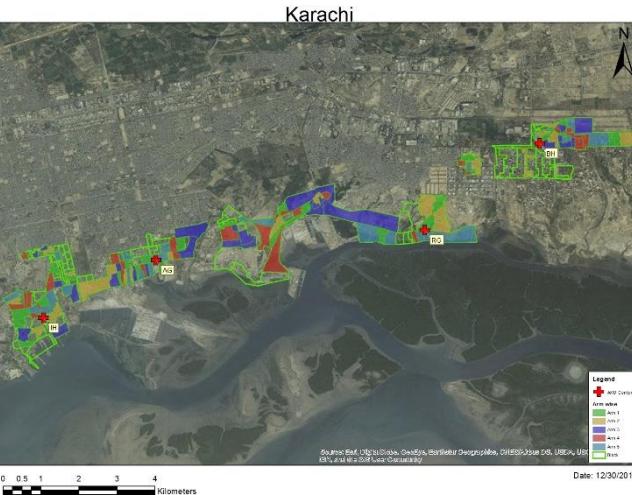


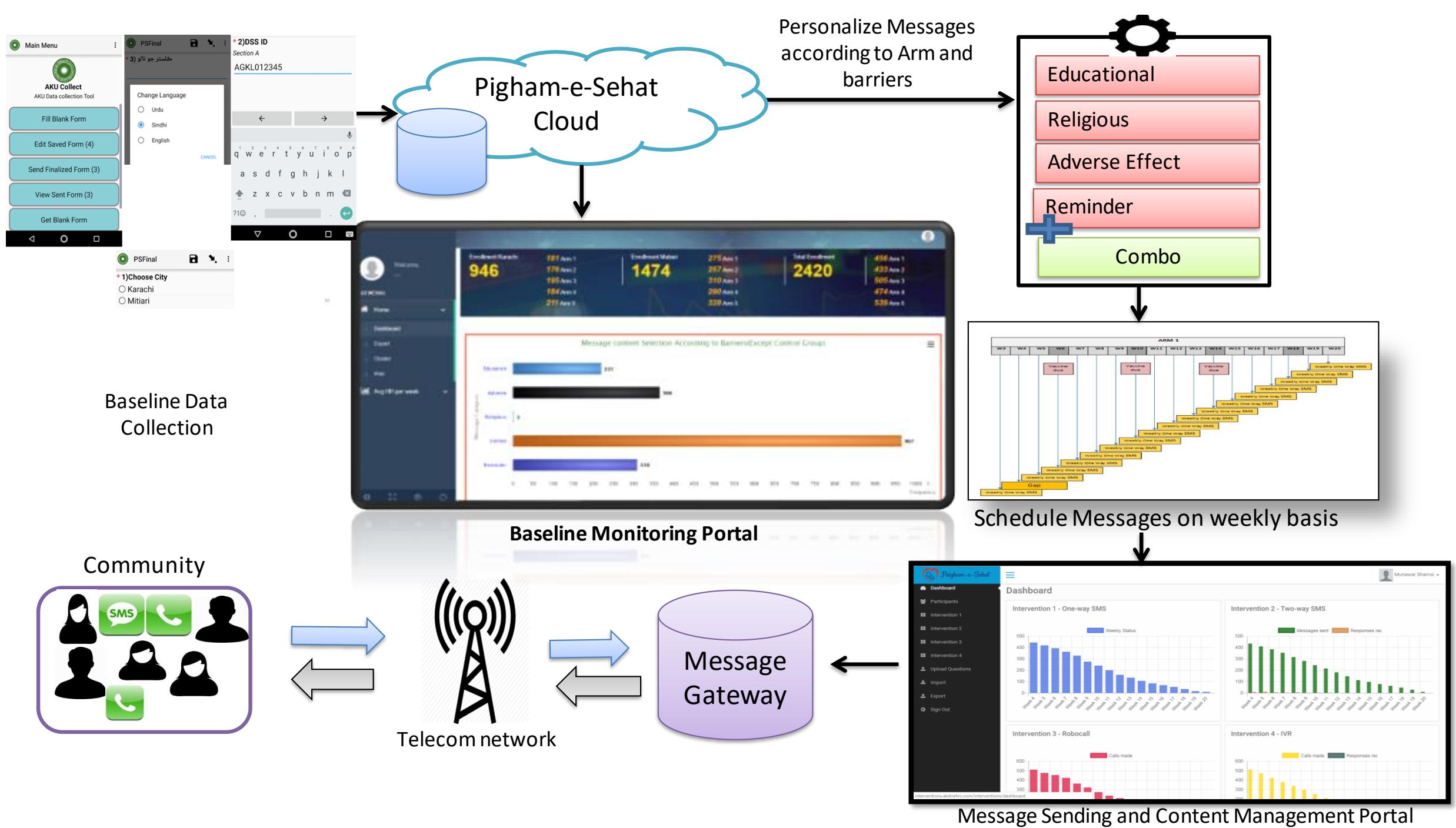
Ek saal ki umar se pehle bacho ko
20 tekay wakt per lagwain jis mai
e ek pedaish per lagta hai. Teko ki
ehmiat ky ly 2 likh kr reply krein

lifazati teekay aap k bachay ki sehat
liy faidamand hain or khatarnak
seemariyo se bachanay ka mehfuz
areeka hai. Teko ki tadaat ky ly 2 likh
r reply krein

Cluster Randomized Control Trial n= 3383

INTERVENTION ARM	WEEKLY AUTOMATED SMS TEXT AND AUTOMATED CALLS FROM ENROLMENT TILL 20 WEEKS OF LIFE
ARM 1 (INTERVENTION)	Parents/care giver will receive one way educational/reminder/proactive SMS messages related to routine immunization once a week till 20 weeks of age
ARM 2 (INTERVENTION)	Parents/care giver will receive two way (interactive) educational/reminder/proactive SMS messages related to routine immunization once a week till 20 weeks of age-parents will have the option to reply and receive more information related to immunization through text messages
ARM 3 (INTERVENTION)	Parents/care giver will receive one way educational/reminder/proactive automated phone call related to routine immunization once a week till 20 weeks of age
ARM 4 (INTERVENTION)	Parents/care giver will receive two way (interactive) educational/reminder/proactive automated phone call related to routine immunization once a week till 20 weeks of age-parents will have the option to reply and receive more information related to immunization through phone call
CONTROL GROUP	NO INTERVENTION
ARM 5 (CONTROL)	One time counselling at the baseline survey





Baseline data on Mobile phone	Urban Site				Rural Site		
	Total N	Count	%	Total N	Count	%	
Usage and Acceptability							
Access to working phone	1436	1386	96.5%	1957	1940	99.1%	
Provided mobile phone number	1386	1374	99.1%	1940	1924	99.2%	
Type of mobile phone do you use?	1176			1728			
Simple function phone		860	73.1%		1428	82.6%	
Smart phone (Android / IOS/Symbian)		298	25.3%		295	17.1%	
Don't know		18	1.5%		5	.3%	
Internet use on smart phone?	298	183	61.4%	295	261	88.5%	
Prepaid connection	1176	1174	99.8%	1728	1718	99.4%	
Receive SMS messages inquiring health?	1176	1105	94.0%	1728	1681	97.3%	
Receive phone call inquiring health?	1176	1167	99.2%	1728	1722	99.7%	
Mobile phone mode of communication preference ?							
Talking on mobile phone	1176	815	69.3%	1728	1196	69.2%	
Both		350	29.8%		444	25.7%	
Texting		11	0.9%		88	5.1%	
Receive a weekly message related to RI	1176	801	68.1%	1728	880	50.9%	

Conclusion I

- Information regarding families' perceptions of vaccination and the daily life challenges were used to develop personalized mobile phone messages
- The results of this study will be useful to understand the respective effects of SMS text messages vs automated phone based communication to improve RI coverage and timelines
- This information will be further used to developing more complex interventions including personalized app and ML and AI models





Thanks

Study Funded through Rising Star Grand Challenges
Canada

Acknowledgement

Dept. Pediatrics and Child Health
University of British Columbia

AKDN eHRC

Ministry of Health

Study team



Disease	Causative agent	Vaccine	Doses	Age of administration
Childhood TB	Bacteria	BCG	1	Soon after birth
Poliomyelitis	Virus	OPV	4	OPV0: soon after birth OPV1: 6 weeks OPV2: 10 weeks OPV3: 14 weeks
		IPV	1	IPV-I: 14 weeks
Diphtheria	Bacteria	Pentavalent vaccine (DTP+Hep B + Hib)	3	Penta1: 6 weeks
Tetanus	Bacteria			Penta2: 10 weeks
Pertussis	Bacteria			Penta3: 14 weeks
Hepatitis B	Virus			
Hib pneumonia and meningitis	Bacteria			
Measles	Virus	Measles	2	Measles1: 9 months Measles2: 15months
Diarrhoea due to rotavirus	Virus	*Rotavirus	2	Rota 1: 6 weeks Rota 2: 10 weeks



PROMOTING ANTENATAL CARE ATTENDANCE THROUGH A TEXT- MESSAGE INTERVENTION IN SAMOA

Jessica Watterson, PhD, MPH
University of California, Berkeley & IDEO

OUTLINE

- Background
- Study design & methods
- Results
- Discussion

BACKGROUND: MATERNAL HEALTH IN SAMOA



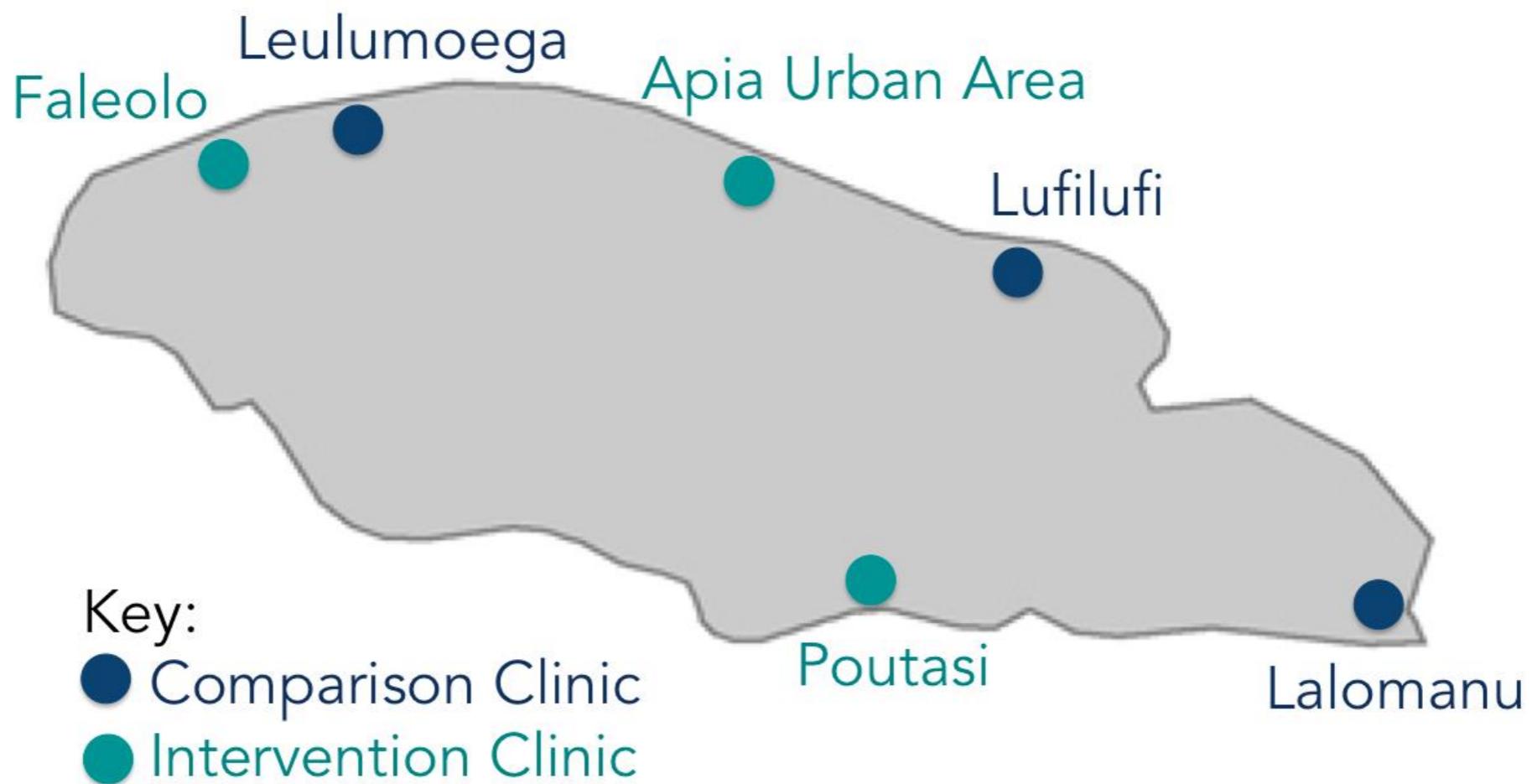
- Samoa, an independent nation in the South Pacific
- 90% mobile phone ownership ¹
- 99% literate ²
- Maternal health indicators:
 - Free antenatal care (ANC)
 - 82% facility delivery ³
 - Only 73% of pregnant women receive 4+ ANC visits ³
 - Only 12% register in first trimester ³
 - 23% of mothers feel they don't need ANC because their baby is in good health ⁴

BACKGROUND: TEXT MESSAGES FOR MATERNAL HEALTH

- Many text messaging programs for maternal health exist but few have evaluated behavior change or health outcomes
- Studies in Zanzibar, Malawi, and India have found:
 - Increased ANC attendance^{5, 6}
 - Increased knowledge, preparedness and satisfaction with care^{7, 8}

STUDY DESIGN

- Upolu, Samoa, March - September 2014
- 6 National Health Service (NHS) clinics



INTERVENTION



- 2-3 messages per week, based on gestation
- Education and reminder messages
- Adapted and translated from MAMA library



DATA COLLECTION

Chart and logbook review (quantitative)

- **Outcome:** Number of antenatal visits attended
- **Control variables:** age, parity, partnership status, employment, distance from village to clinic, gestation at registration

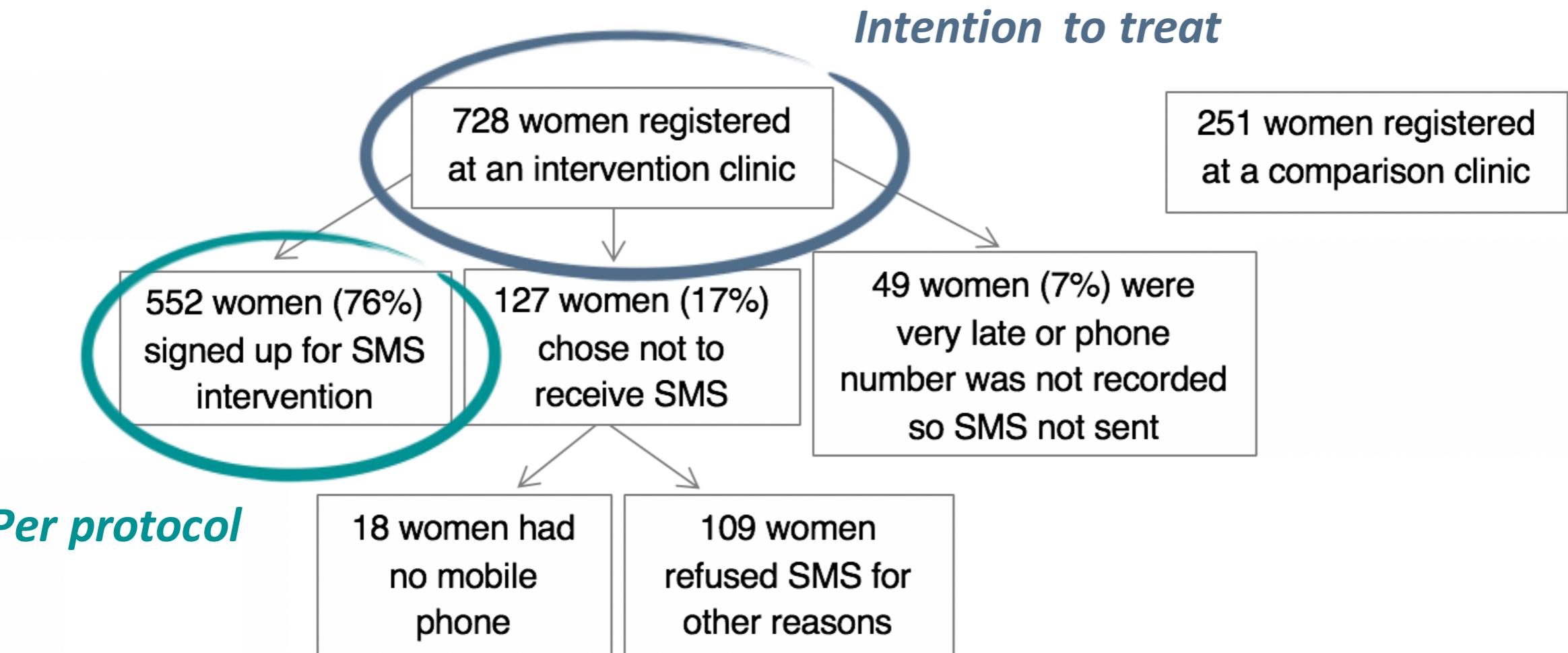
Survey of implementing midwives (mixed-methods)

Implementation notes (qualitative)

DATA ANALYSIS

- Descriptive statistics
- Multivariate regression, controlling for individual characteristics and accounting for clustering in clinics
- Qualitative data was systematically reviewed for common themes

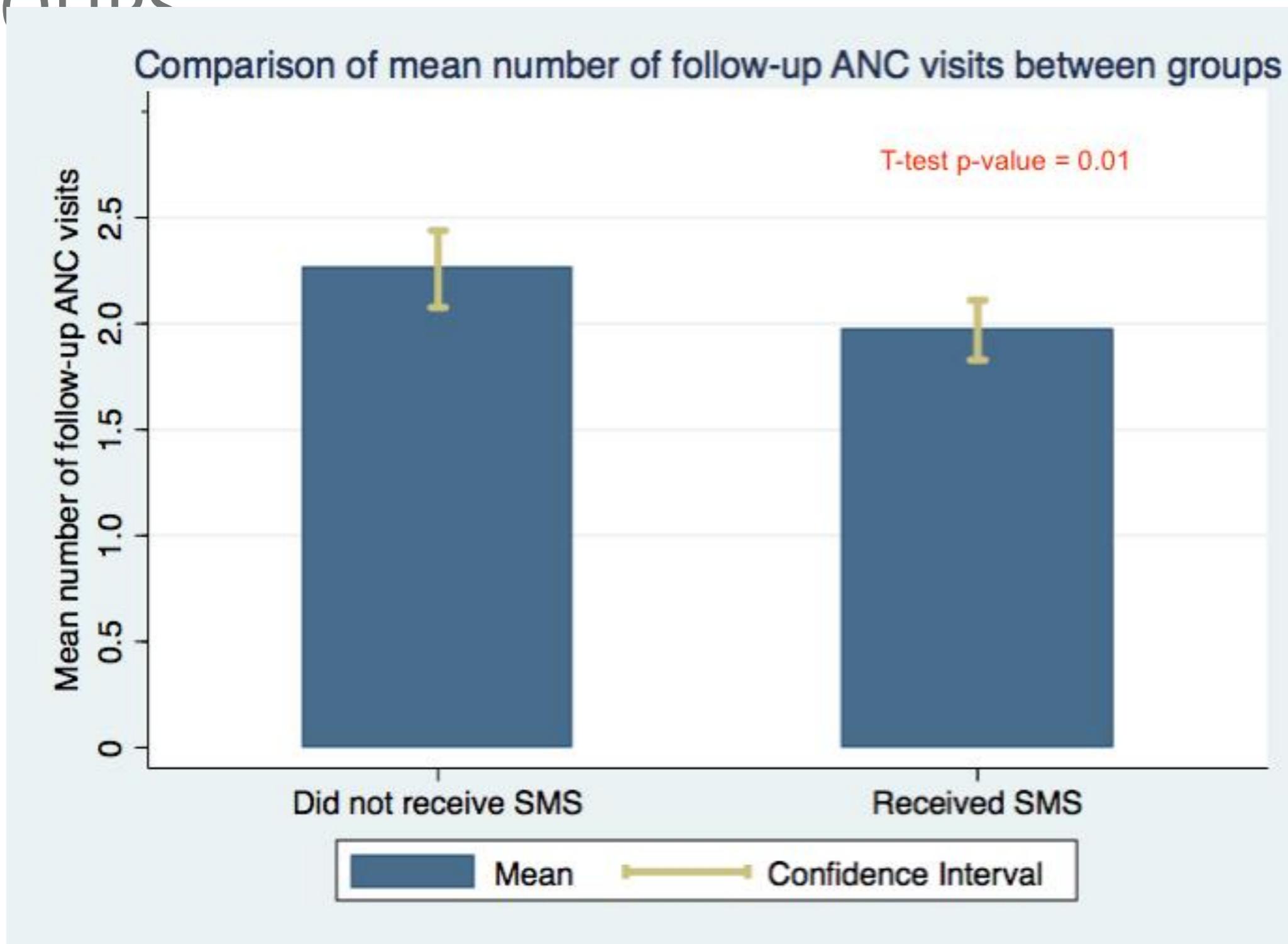
REGISTRATION RESULTS



BASELINE CHARACTERISTICS

Variable	Intention-to-Treat			p	Per-Protocol	
	Intervention (n=577)	Comparison (n=188)			Intervention (n=446)	Comparison (n=319)
Continuous variables: Mean (SD)						
Age	26.7 (6.4)	27.1 (6.5)	0.53	26.6 (6.3)	27.2 (6.5)	0.18
Parity (including current pregnancy)	3.2 (2.0)	3.3 (2.0)	0.62	3.1 (1.9)	3.3 (2.1)	0.25
Distance from home village to registration clinic (km)	11.9 (13.1)	6.6 (7.2)	<0.00	12.3 (13.9)	8.3 (8.6)	<0.00
Gestation at registration (weeks)	27.2 (6.7)	26.5 (6.0)	0.13	27.4 (6.5)	26.6 (6.6)	0.10
Number of follow-up antenatal visits attended	2.2 (1.9)	2.6 (1.7)	0.01	2.1 (1.7)	2.5 (1.9)	<0.00
Categorical variables: n (%), excluding missing						
Married/in partnership	519 (89.9%)	171 (91.0%)	0.69	401 (89.9%)	289 (90.6%)	0.75
Employed and/or partner employed	405 (70.2%)	89 (47.1%)	<0.00	327 (73.3%)	167 (51.9%)	<0.00

COMPARISON OF ANC ATTENDANCE BETWEEN GROUPS



COMPARISON OF ANC ATTENDANCE BETWEEN GROUPS

Variable	Intention-to-Treat			Per-Protocol		
	Estimate	SE	p	Estimate	SE	p
Intervention Group	-0.32	0.19	0.15	-0.37	0.15	0.05
Age at Registration	0.01	0.02	0.56	0.01	0.02	0.59
Married/in partnership	-0.12	0.27	0.68	-0.12	0.29	0.70
Parity	-0.04	0.05	0.45	-0.04	0.05	0.44
Employed and/or partner employed	-0.22	0.15	0.21	-0.19	0.18	0.33
Distance from home village to registration clinic (km)	0.00	0.00	0.39	-0.00	0.00	0.34
Gestation at registration (weeks)	-0.02	0.01	0.01	-0.02	0.01	0.03
Constant	3.17	0.45	<0.00	3.14	0.41	<0.00

IMPLEMENTATION RESULTS

Barriers

- Inconsistent registration for messages
- Sharing of mobile phones
- Late ANC registration

Facilitator

- In-person registration

Suggestions

- Incorporating more traditional local practices into messages, such as avoiding abdominal massage
- Include husbands or partners

DISCUSSION

Limitations

- No randomization at individual level
- No data on pregnancy complications
- One intervention site was larger than all others
- Missing records/data

DISCUSSION

Potential explanations for these results:

- Some evidence that bidirectional or more interactive programs might be more effective^{6,9,10}
- Women might substitute information for more time and resource intensive ANC

Evaluation and human-centered design is essential

Further study of the effectiveness of specific features and in specific contexts is needed

THANK YOU

- Participating midwives and women
- Caricia Catalani, DrPH, MPH
- Diego Castaneda, DrPH, MPH



Ministry of Health



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