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Exploring Mobile Technology to Enhance Birth Outcomes in Rural Mozambique:
Pilot Study Results

By

M. REMA

B.S., Statistics
UNIVERSITY OF GEORGIA

A Thesis Submitted to the Graduate Faculty
of Georgia State University in Partial Fulfillment
of the
Requirements for the Degree

MASTER OF PUBLIC HEALTH

ATLANTA, GEORGIA
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Dr. Ike Okosun, PhD, MPH, MS, FRSPH, FTOS

Friends and Family

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APPROVAL PAGE

EXPLORING MOBILE TECHNOLOGY TO ENHANCE BIRTH OUTCOMES IN
RURAL MOZAMBIQUE: PILOT STUDY RESULTS

By

M. REMA, BS

Approved:

Committee Chair

Committee Member

Committee Member

Date

ABSTRACT

INTRODUCTION: Public health is defined as the science of preventing disease, prolonging life and promoting health through systematic efforts and educated choices by communities, organizations and individuals around the globe. World Vision is no stranger to this. The World Vision Organization currently has a Mobile Health division. Mobile Technologies for Health (mHealth) is the term used for practicing medicine and public health, supported by mobile phones and other communication devices, such as tablets and personal digital assistants. This new field has emerged as a viable source to communicate health needs and collect community health data. It has been proven to help deliver healthcare information to community health workers (CHW), researchers, physicians and patients, in real-time.

AIM: The goal was to compare two groups of prenatal mothers and see if mobile phone technologies provided a viable resource to better serve the health care needs of those in the rural area of Mozambique.

METHODS: The mobile phones were used for health promotion plus data collection, CHW training and emergency referral. The mobile phones were implemented into the intervention group and were compared to control group: CHWs without the mHealth intervention. A survey was administered at the end of the study to women in both groups and the data was analyzed to compare the experimental group with the control group to see if the intervention led to more awareness and knowledge of pregnancy and postpartum danger signs in women. Odds ratios, confidence intervals and p-values for each indicator were calculated and compared between groups.

RESULTS: The results above show, mothers who know at least 2 danger signs in pregnancy is significantly higher in the control area (68%, $OR=0.4$, $p\text{-value}=0.009$) than in the intervention group (51.6%). The proportion of mothers who know danger signs in the postpartum period is fairly low in both groups, but the intervention group (11.8%, $OR=0.4$, $p\text{-value}=0.05$) is significantly higher than the control group (5.3%).

DISCUSSION: Based on the findings, the interventions group was also more likely to know about pregnancy and postpartum danger signs than the control group. Because the difference in the two groups was the mHealth intervention modules, it can be proven that the cause of the improvements between the groups was the mobile phones; though a self-selection bias could have accounted for the difference between the groups.

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Exploring Mobile Technology to Enhance Birth Outcomes in Rural Mozambique: Pilot Study Results

Chapter I INTRODUCTION

Public health is defined as the science of preventing disease, prolonging life and promoting health through systematic efforts and educated choices by communities, organizations and individuals around the globe. World Vision is no stranger to this. World Vision is a Christian humanitarian organization dedicated to working with children, families, and their communities worldwide to reach their full potential by tackling the causes of poverty and injustice (Cherian). The company works in nearly 100 countries and serves all people, regardless of gender, race, ethnicity or religious status. Their goal is to provide emergency assistance to children and families affected by natural disasters and civil conflict. The company strives to work with communities to develop long-term solutions to alleviate poverty in undeveloped countries and advocate for justice, on behalf of the poor.

The World Vision Organization currently has a Mobile Health division. Mobile Technologies for Health (mHealth) is the term used for practicing medicine and public health, supported by mobile phones and other communication devices, such as tablets and personal digital assistants (PDAs). It is a growing set of tools being applied in diverse health settings (Chang, Njie-Carr, Kalenge, Kelly, Bollinger & Talisuna, 2013) and has the potential to improve

tens of thousands of lives each year (Tamrat & Kachnowski, 2011). This new field has emerged as a viable source to communicate health needs and collect community health data. It has been proven to help deliver healthcare information to community health workers (CHW), researchers, physicians and patients, in real-time (Cherian). With this new medium, consisting of various applications and modules, public health has the ability for improved diagnosis, timelier public health information delivery over a larger area and expanded access to medical education to train CHWs.

Our project focused on women in Mozambique, of the Zambézia province, and their knowledge on pregnancy and postpartum danger signs. Infant mortality is a serious issue in these rural and dispersed areas. It is important for women to learn the common warning signs that come with pregnancies to ensure a healthy pregnancy, delivery and healthy newborn. Healthy pregnancies and knowledge on postpartum danger signs is not common in remote areas of Zambézia, due to the province only have one provincial hospital, five rural hospitals and only 179 health centers, serving a populations of almost 3.8 million people. Because of these limited resources, World Vision is striving to use mHealth to better the access of healthcare needs across this province for women and help train CHWs to better recognize complications and increase timely referral and utilization of maternal and newborn health services. Target locations for this study were areas with hilly terrain, with little access to health services, primarily emergency obstetric, postpartum and newborn care.

For this particular study, the goal was to create a mobile phone or tablet application that consisted of Pregnancy and Postpartum Modules which assisted the CHW when assessing a patient's healthcare needs. The application and modules were developed my CommCareTM, which drew content from material created by the World Health Organization (WHO). It contains

interactive and voice-based algorithms programmed in cell phones and tablets on possible danger signs in the pregnant woman or newborn. With this study and application, the project attempted to answer the following questions:

1. Will the use of mobile phone based Pregnancy and Postpartum Modules by CHWs in remote villages result in an increase mothers' access to skilled and safe delivery service and newborn care?
2. Will the use of mobile phone based modules improve assessment and recognition of complications and increase timely referral and utilization of health care services?
3. Will the use of mobile phones improve communication to higher trained health workers and access to care of pregnant women during complications and emergencies?
4. What components of the modules are appropriate, feasible and sustainable in implementing mobile phone assistance in remote villages?
5. What key barriers exist at the community level that affects the use of mobile phone assistance by CHWs?

The study consisted of two phases: Phase I project assessed the effectiveness of CHWs using a cellphone-based assessment and referral system in potentially decreasing maternal and newborn complications and deaths resulting from issues of timely information, care and access to services. The study would have an experimental group that used mHealth technologies for CHWs on mothers and newborns, and a control group that did not have the mHealth resources. The goal was to compare the two groups and see if mobile phone technologies provided a viable resource to better serve the health care needs of those in the rural area of Mozambique.

The purpose of my Capstone project was to analyze data from both groups on women's knowledge of indicators of post-partum complications, collected from surveys, by calculating

odds ratios, confidence intervals and p-values for each indicator and comparing them between each of the groups. The study was a “post-test only” intervention research, with the implementation of the proposed mHealth intervention. We hope to find that the intervention groups of women have a better understanding of possible pregnancy complications and post-partum danger signs along with better skilled CHWs and access to healthcare services. Other outcomes we expected increased percentage of Healthy Actions taken by pregnant women and an increased use of midwives and expert services via phone calls. The key stakeholders in our study were the community, the government of the Mozambique, Ministry of Health, and technology partners: Gates Foundation, CommCareTM, Dimagi and other various donors.

Chapter II

REVIEW OF THE LITERATURE

The use of technology to improve global health is a new frontier in public health research. The global proliferation of mobile technology has generated a new tool to address public health challenges and shift the paradigm of health care access and delivery (Tamrat & Kachnowski, 2011). Given limited resources found in rural areas, delivering specific healthcare messages, programs, and services can be a challenge. There is an ongoing, broad policy debate about the value of communications technology in promoting global development objectives (Kaplan, 2006). Though there are disputes about the validity of using communications technology in developing areas. It is sometimes thought of as just a “quick fix” to health problems and with the information barriers and lack of skilled workers, it is unrealistic to intervene with this type of intervention. Though, the growing enthusiasm for mHealth is not driven only by the demonstrated benefits of mobile technology, but also by the widespread availability of mobile phones and the relatively low levels of literacy required to use them (Leon, Schneider & Daviaud, 2012).

Channels Use for Health Communication

Community Health Workers. The resources that these rural areas do have are Community Health Workers. CHWs, in Africa, are people chosen by the community members or organizations. They provide medical help and healthcare needs to those with limited access to healthcare and to those who live in remote areas, far away from professional medical help. But these CHWs need to be trained properly to administer health protocols to those in need. Community health workers are a key cadre to whom tasks are shifted but their effectiveness can be limited by inadequate resources and supervision (Chang, Kagaayi, Arem & Nakigozi, 2011).

Mobile Phones. Mobile telephone subscriptions have been growing rapidly since the 1980s in both developing and developed countries (Kaplan, 2006). In 2002, mobile phone subscribers overtook landline subscribers, worldwide, across all regions, economic and socio-demographic criteria. According to the Telecommunications Union, mobile coverage has increased to reach 90% of the world's total population and 80% of the global population living in rural areas (Tamrat & Kachnowski, 2011). The term "telemedicine" first surfaced into scientific literature and was defined as the delivery of health care and sharing of medical knowledge over a distance using telecommunications (Kaplan, 2006). Soon after, the word "e-health" was coined and that later became mHealth. The social value of a mobile phone is highly valued, even in the resource-poor areas (Kaplan, 2006). The combination of skilled CHWs and mobile technologies can provide the necessary intervention, for those who need it.

mHealth. mHealth has changed the way healthcare professionals communicate with their patients. Mobile phone access in low and middle-income countries is rapidly expanding and offers an opportunity to leverage limited human resources for health (Chang, Kagaayi, Arem & Nakigozi, 2011). This new and upcoming technology provides a new medium, not only for

skilled health workers, but for CHWs in these certain areas. In such regions, mHealth can effectively improve basic care and help on the combat against endemic and epidemic diseases not so often encountered in developed countries (Iwaya, Gomes, Simplicio, Carvalho & Dominicini, 2013). Mobile phones, not only help teach CHWs to be better trained and aware of healthcare needs, but they provide the necessary and timely response for those who need immediate attention, via phone calls or text messages.

There are several aspects of the impact of mHealth on personal health. For example, the barriers, with which health professionals and patients, are lowered due to the ability to contact one another at any given moment, which also alleviates the barrier of time-sensitive information. The use of short messages system (SMS, or text messages) is rapidly growing and becoming more and more useful. SMS require a low-bandwidth connection and can be used to contact medical help in a timely manner. Health-related applications for mobile phones are emerging in the commercial sector (Patrick, Griswold, Raab & Intille, 2008) and their effectiveness is beginning to get noticed. These applications help track people's behaviors and can be used to improve medical issues. Coupled with modules to train CHWs, the use of mobile technologies can not only serve resource-poor communities to have better access to healthcare but alleviates pressure on medical staff to be everywhere at one time. With this intervention in place, healthcare professionals can be where they are most needed but still be accessible for assistance at any given moment.

There are many benefits to a mHealth intervention. In one study, an overarching theme was that healthcare communication was an interconnected web involving patients, CHWs, clinical staff and family and friends (Chang, Kagaayi, Arem & Nakigozi, 2011). Patients, CHWs and staff noticed the impact of voice calls expedited patient care. There was an apparent

significant saving of travel time for CHWs with phones compared to those without phones as clinic sites were far away. Text messaging has also had impact on patients. With the ability for CHWs to send a message to the healthcare provider of a patient not adhering to his or her medication, patients are more motivated to take their pills. Mobile phones also gave the CHWs a sense of empowerment (Chang, Kagaayi, Arem & Nakigozi, 2011). With this feeling, CHWs were more inclined to do their jobs, visit their patients and do their work honestly.

This intervention is especially needed in areas such as Mozambique. Its population is mainly rural and health facilities are distant from most families in these hilly terrain areas. In 1996, UNICEF estimated Mozambique's infant mortality at 133 per 1,000 live births, mortality of children younger than five at 214 per 1,000 live births, and maternal mortality at 1,500 per 100,000 live births (Gloyd, Floriano, Seunda, Chadreque, Nyangezi & Platas, 2001). With these high mortality rates, together with health facilities being tough to reach, mHealth and CHWs serve as the first responders to mothers. Coupled with the low start-up costs, mobile phones, CHWs and its abilities have a serious chance at changing the way healthcare is delivered around the world.

Chapter III

METHODS AND PROCEDURES

The application used in this study was created by CommCare™, a mobile and web-based platform that creates software for healthcare-related information around the world, along with its technical partner, Dimagi. The mobile phones were used for health promotion plus data collection, CHW training and emergency referral. The mobile phones were implemented into the intervention group and were compared to control group: CHWs without the mHealth intervention. Not only was the application a tool for supervision and evidence-based change, but a way to capture data in electronic form to better track patients and their records and reduce paper burden (Chang, Njie-Carr, Kalenge, Kelly, Bollinger & Talisuna, 2013). The application was designed to improve access, quality and experience of care; it provides data-driven management and can be used across all platforms (phones, tablets, etc.) A survey was administered at the end of the study to women in both groups and the data was analyzed to compare the experimental group with the control group to see if the intervention led to more awareness and knowledge of pregnancy and postpartum danger signs in women. The study was funded by the United States Agency for International Development (USAID) and the Gates Foundation.

Program Implementation and Procedures

The study included twenty-four CHWs, who received 10 days of training in the use of the Pregnancy and Postpartum Modules through CommCare™, which was installed on the phone. As many of the CHWs lacked experience using mobile phones, most of the training focused on certain basic skills of how to operate a phone, as well as using the application. The CHWs were trained on how to turn on the phone and also type text messages, as they needed to do this when registering the patient into the program. Once trained, the CHWs implemented the intervention between June, 2011 and January, 2012. The CHWs visited the homes of pregnant women and newborns, worked through the pregnancy and postpartum modules with the family. If any of the danger signs were found at the home, the CHW facilitated simple actions in the home and expedited referral to medical help. All of the data collected was sent to a central database.

Once CHWs enrolled pregnant women, they completed multiple home visits both pre and one post-delivery, completing the mHealth intervention during the visits. Each of the CHWs were responsible for visiting 15 families in their assigned community and if a woman was found to be pregnant within one of those families, the CHW was required register the woman's information into the program on their phone as soon as possible. The protocols on the program for registering the client includes saving the name, age and how many months the woman is pregnant. The CHW then proceeds with the modules relating to danger signs, found in the CommCare™ program. If the woman responds "yes" to any of these questions, the CHW must refer her to a health facility. If she responds "no", then the program continues to questions which are non-urgent as well as reminders or advice to ensure she experiences a safe pregnancy. CHWs continue these visits and follow up with the pregnant woman until she gives birth, using the program on the mobile device. After she gives birth, the CHW must visit her once, to complete a

postpartum form on the program and to ask her questions, to ensure she is healthy. The information is sent to the CommCare™ database, where all the data is collected and analyzed.

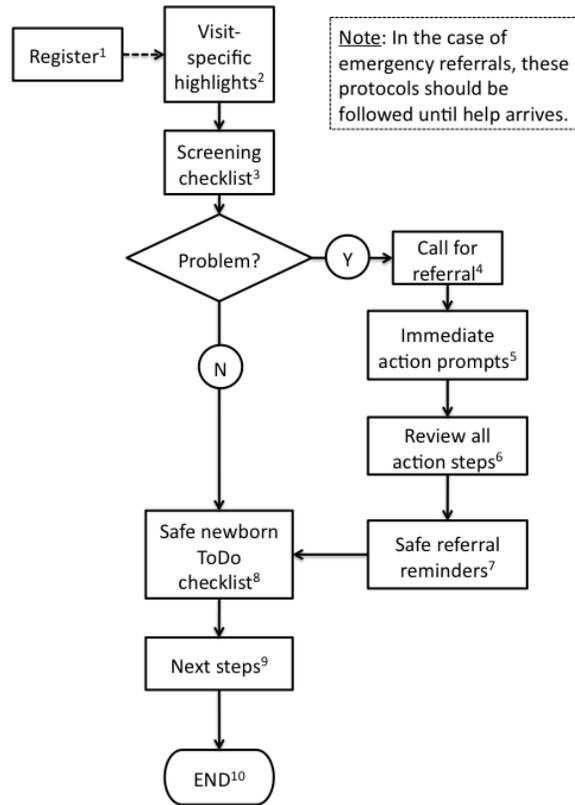


Figure 3.1 Decision Making Framework

At the end of the implementation period, a household survey was carried out in the project location and in the control location, within the implementation area. The control area was similar to the intervention area, in terms of terrain, population density, literacy levels and access to health services. The survey included mothers with a child less than 12 months of age, and a random sample of mothers from the project location and the control area.

The survey instrument was adapted from the maternal and neonatal care module of the Knowledge, Practices and Coverage (KPC) Survey questionnaires developed by the Collaborations and Resources (CORE) Group for Child Survival. The survey gauged the

utilization of antenatal and delivery services in the two areas as well as knowledge of mother's danger signs and the actions to be taken when any of them is present.

I was given the task of analyzing the data on Household Services: Knowledge and Action for Danger Signs for mothers. I analyzed the data using the statistical program STATA9 and frequencies, p-values and odds ratios (OR) were calculated to compute differences between the intervention and control areas, the level of significance of these differences and the relative likelihood of the measured outcomes, amongst the two groups. Standard interpretations were used: alpha levels of 0.05 were interpreted as representing a real measure in the intervention and control populations and odds ratios greater than 1 were taken to represent significantly greater likelihood of the occurrence in the intervention group compared to the control group. Danger signs that were included in the measurements were bleeding, pain, fever and convulsions.

Chapter IV RESULTS

Results from the household survey are explained below. The survey had a total sample of 188, with 93 from the intervention area and 95 from the control area. There were similar numbers of boys and girls amongst children under 12 months of age, in both areas. It was found that more mothers in the control area had ever attended school and more mothers in the intervention group worked outside the home. Table 1 presents background characteristics of the participants.

Table 4.1 Demographic Background of Program Participants

Background Characteristics	Results (% , 95% CL)	
	Intervention Area	Control Area
Sex of children of mothers interviewed:		
Boys	48.9 (38.2-59.7)	46.7(36.1-57.5)
Girls	51.1 (40.3-61.8)	53.3(42.5-63.9)
Mothers who have ever attended school	51.6 (41.0-62.1)	73.7 (63.6-82.2)
Mothers who work outside the home	67.7 (57.3-77.1)	58.9 (48.4-68.9)

Table 4.1 Household Survey: Background Characteristics

The data I was responsible for, data on mother's knowledge of pregnancy and postpartum danger signs, was analyzed and yielded the following results, found in Table 2.

Indicator	Intervention Area		Control Area		p value	OR
	%	N	%	N		
Mothers who know at least 2 danger signs in pregnancy	51.6	93	68.4	95	0.009*	0.4
Mothers who know at least 2 actions to be taken for bleeding in pregnancy	17.2	93	14.7	95	0.3	0.8
Mothers who know at least 2 actions to be taken for fever in pregnancy	3.2	93	9.5	95	0.04*	3.1
Mothers who know at least 1 action to be taken for fits during pregnancy	4.6	87	1.1	91	0.09	0.2
Mothers who know at least 2 danger signs during/after delivery	11.8	93	5.3	95	0.05*	0.4
Mothers who know at least 2 actions to be taken for excess bleeding during/after delivery	1.1	93	0	95	0.2	0
Mothers who know at least 2 actions to be taken for fever during/after delivery	1.1	93	1.1	95	0.4	0.9
Mothers who know at least 2 actions to be taken for fits during/after delivery	1.1	93	0	95	0.2	0

Table 4.2 OR for Indicators

The results above show, mothers who know at least 2 danger signs in pregnancy is significantly higher in the control area (68%, $OR=0.4$, $p\text{-value}=0.009$) than in the intervention group (51.6%). The higher proportion of school attendance history amongst mothers could have accounted for this difference. The proportion of mothers who know danger signs in the postpartum period is fairly low in both groups, but the intervention group (11.8%, $OR=0.4$, $p\text{-value}=0.05$) is significantly higher than the control group (5.3%). The table also reveals that the proportion of mothers who know at least 2 actions to be taken for fever in pregnancy was higher in the control group (9.5%, $OR=3.1$, $p\text{-value}=0.04$) than the intervention group (3.2%). The rest of the comparisons of the danger sign between the two areas were not found to be significant. The CHWs reported that they were able to use the mobile phone templates with ease and that the recorded algorithms help them make decisions for women who report complications. They reported successful facility referrals for such women and were pleased that their referrals were given priority attention, once at the facility.

Chapter V

DISCUSSION AND CONCLUSION

The technologies that are the basis of mobile phones are becoming more powerful and cheaper and evidence is beginning to emerge about the value of mobile phones for the delivery of healthcare services and the promotion of personal health (Patrick, Griswold, Raab & Intille, 2008). Pregnant women in the project's intervention group had a higher likelihood of accessing antenatal care, preparing for birth and have births assisted by a skilled provider. Based on my findings, the intervention group was also more likely to know about pregnancy and postpartum danger signs than the control group. Because the difference in the two groups was the mHealth intervention modules, it can be proven that the cause of the improvements between the groups was the mobile phones; though a self-selection bias could have accounted for the difference between the groups. The intervention increased the likelihood of pregnant women accessing healthcare and skilled assistance at birth and their knowledge about complications. It has also led to CHWs successfully referring those with a possible complication, and continued follow up with healthcare facilities. The project has also demonstrated that it is possible for CHWs to successfully use forms for recording and transmitting data and make timely, informed decisions about possible complications using algorithms embedded in the mobile phone system. Further

studies should focus on reasons for low-level knowledge in the women populations and low-level referrals of women who need the most assistance. Logistical issues, such as access to electricity to charge the phones and sufficient bandwidth to send larger sets of data should be reviewed to minimize these limitations.

Limitations

In general, one obvious challenge for implementing this mHealth intervention was the difficulty of charging the mobile phones. CHWs reported difficulty getting to the solar charges in time to charge their phones. Phone maintenance was also an issue. Another challenge was CHWs sometimes had their phones stolen. Quality of life was raised as an issue. From obnoxious ringtones to unavoidably overheard conversations, the use of mobile phones in public has, from the perspective of many, become highly problematic (Patrick, Griswold, Raab & Intille, 2008). This could have led to an issue of confidentiality.

There were limitations found specifically from this study. Along with the CHW's literacy, the visual ability of CHWs was an issue. The mobile phones tended to have small screens and CHWs needed to be able to deliver the correct information from the modules to the patient. Access to power was anticipated of being an issue. Operational issues and issues with the general program surfaced, but the CHWs using mobile phones for their personal use became a problem. There was also a struggle with low acceptance amongst the communities they serve. Picking the locations for the intervention and control group could have led to a selection bias as well, which could have limited the significance of the findings on the study.

Future Directions for Research

Future studies should consider taking more time to teach basic phone operational uses to help better the understanding of the mobile devices for the CHWs. Finding new, efficient and

accessible power sources is essential for charging the mobile devices. mHealth has the great potential to become a steady and viable resource in rural areas that lack the necessary health resources for their population. Studies should branch out and have this type of intervention more common in rural areas of the world. And as technology continues to strive forward, mHealth will become easier to implement and use across the world.

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Appendices (Survey)

**Gates mHealth Survey Questionnaire
WORLD VISION Mozambique
February 2012**

Ask the mother if she has a child under 12 months who lives with her. If yes, proceed with interview, if no thank the mother and end the interview.

Identification	
Household Number	
Record Number	
Name of the village	
Name of the mother	
Age of the mother	
Name of supervisor	

	1
Interview date	___/___/___ day/mon th/year
Name of interviewer	
Result code*	
*Result codes: 1. Completed 2. Respondent not at home 3. Not pregnant or not delivered by June 2011 4. Refused 5. Other _____ Specify	

INFORMED CONSENT	
<p>Hello. My name is _____, and I am working in coordination with World Vision. We are conducting a survey and would appreciate your participation. I would like to ask you about your health and the health of your youngest child under the age of one. This information will help World Vision to plan health services and assess whether it is meeting its goals to improve mothers and children's health. The survey usually takes _____ minutes to complete. Whatever information you provide will be kept strictly confidential and will not be shown to other persons.</p> <p>Participation in this survey is voluntary and you can choose not to answer any individual question or all of the questions. However, we hope that you will participate in this survey since your views are important.</p> <p>At this time, do you want to ask me anything about the survey?</p> <p>Do you want me to continue asking questions? Yes _____ No _____</p> <p>Signature of interviewer: _____ Date: _____</p>	
RESPONDENT AGREES TO BE INTERVIEWED.....	RESPONDENT DOES NOT AGREE TO BE INTERVIEWED.....

ALL QUESTIONS ARE TO BE ADDRESSED TO MOTHERS WITH A CHILD LESS THAN 12 MONTHS OF AGE

o.	Questions and Filters	Coding Categories	Skip								
Introduction											
1	Were you pregnant or delivered as of June 2011	YES.....1 NO.....2	→ If NO, stop interview								
2	What is the name, sex, date of birth of your youngest child that you gave birth as of June 201 and is still alive?	<p align="center">YOUNGEST CHILD</p> NAME _____ <p align="center"><u>SEX</u></p> MALE.....1 FEMALE.....2 <p align="center"><u>DATE OF BIRTH</u></p> DAY <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr></table> MONTH <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td></tr></table> YEAR									
3	Have you ever attended School?	YES.....1 NO.....2	→ 5								
4	If yes , what is the highest level of school you have attended ?	<p align="center">(Single response)</p> INFORMAL (MOSQUE,MADRASA) A PRIMARY (1-5) B PRIMARY (6-8) C SECONDARY(S1-S4) D HIGH SCHOOL(S5-S6) E HIGHER (COLLEGE)/ University F									

o.	Questions and Filters	Coding Categories	Skip
5	Do you work outside of the home?	YES.....1 NO.....2	→7
6	IF YES, What kind of work do you do?	HANDICRAFTS.....A HARVESTING.....B SELLING FOODS.....C SHOP KEEPER/STREET VENDOR.....D SERVANT/HOUSEHOLD WORKER.....E SALARIED WORKER.....F OTHER _____ Y (SPECIFY)	
ANTENATAL CARE			
7	During your pregnancy with (Name), did you see anyone for antenatal care?	YES.....1 NO.....2	→ 10
8	IF YES: Whom did you see? Anyone else? PROBE FOR THE TYPE OF PERSON AND RECORD ALL PERSONS SEEN.	DOCTOR/MEDICAL ASSISTANT.....A NURSE.....B MIDWIFE.....C TRADITIONAL BIRTH ATTENDANT.....D CHW.....E OTHER _____ F (SPECIFY)	

o.	Questions and Filters	Coding Categories	Skip
9	During your pregnancy with (Name), how many times did you receive antenatal care?	One Visit.....A Two visit.....B Three visit.....C Four visits or moreD DON'T KNOW.....99	
10	During your pregnancy with (Name) did you receive an vaccine in the arm to prevent the baby from getting tetanus that is convulsions after birth?	YES.....1 NO.....2 DON'T KNOW..... ...99	→ 12 → 12
11	While pregnant with (name), how many times did you receive such an vaccine ?	ONE.....1 TWO.....2 THREE OR MORE.....3 DON'T KNOW.....99	
12	Did you receive any Iron and folic acid supplements at any time before that pregnancy, including during a previous pregnancy or between pregnancies?	YES.....1 NO.....2 DON'T KNOW.....99	→ 14 → 14
13	How many times did you receive iron and folic acid supplements ?	One time.....A Two timesB Three times.....C Four timesD Five times.....E Six times.....F Seven times.....G DON'T KNOW.....99	
14	Did you check (by health care providers) your blood pressure (BP) during your last pregnancy?	YES.....1 NO.....2 DON'T KNOW.....99	
15	Had you prepared well before giving birth? Have you had birth preparedness plan (money, transport, appointment at a health facility, etc)	YES.....1 NO.....2 DON'T KNOW.....99	

o.	Questions and Filters	Coding Categories	Skip
16	<p>What signs and symptoms during pregnancy would indicate the need to seek health care outside home?</p> <p>(MORE THAN ONE RESPONSE POSSIBLE) RECORD ALL</p>	FEVER.....A ABDOMINAL PAIN.....B BLEEDING.....C FITS/CONVULSIONS.....D SWELLING of HANDS/FACE/FEET.....E BABY NOT MOVING.....F OTHERS.....G (SPECIFY) DON'T KNOW.....99	
17	<p>Number of danger signs identified by the mother</p> <p>(Interviewer to calculate from QN #16)</p>		
18	<p><i>If you experience one or more of these danger signs during your pregnancy what immediate action steps do you take?</i></p> <p>(MORE THAN ONE RESPONSE POSSIBLE) RECORD ALL</p>	CALL FOR HELP (transport, money).....A HAVE WOMEN LIE DOWN.....B COVER WOMEN.....C LIQUIDS EVERY HOUR.....D OTHERS.....E (SPECIFY) DON'T KNOW.....99	
19	<p><i>If you experience bleeding during your pregnancy what action steps do you take?</i></p> <p>(MORE THAN ONE RESPONSE POSSIBLE) RECORD ALL</p>	HELP WOMEN TO PASS URINE.....A CONTROL BLEEDING.....B TAKE IMMEDIATELY TO HEALTH FACILITY.....C OTHERS.....D (SPECIFY) NONE.....E DON'T KNOW.....99	
20	<p><i>If you experience pain or fever during your pregnancy what action steps do you take?</i></p> <p>(MORE THAN ONE RESPONSE POSSIBLE) RECORD ALL</p>	LIE DOWN IN SEMI_SITTING POSITION....A COVER WITH CLOTH.....B SPONGE BATH IF FEVER IS HIGH.....C HELP WOMEN PASS URINE.....D TAKE IMMEDIATELY TO A HEALTH FACILITY SITE.....E NONE.....F OTHERS.....G (SPECIFY) DON'T KNOW.....99	

o.	Questions and Filters	Coding Categories	Skip
21	<p>If you experience Fits/Convulsions during your pregnancy what action steps do you take?</p> <p>(MORE THAN ONE RESPONSE POSSIBLE) RECORD ALL</p>	<p>LIE ON LEFT SIDE.....A</p> <p>NONE.....B</p> <p>OTHERS.....C (SPECIFY)</p> <p>DON'T KNOW.....99</p>	
22	<p>Who assisted with the delivery of (Name)?</p> <p>Anyone else?</p> <p>PROBE FOR THE TYPE(S) OF PERSON(S) AND RECORD ALL MENTIONED.</p> <p>IF RESPONDENT SAYS NO ONE ASSISTED, PROBE TO DETERMINE WHETHER ANY ADULTS WERE PRESENT AT THE DELIVERY.</p>	<p>DOCTOR.....A</p> <p>NURSE.....B</p> <p>MIDWIFE.....C</p> <p>TRAINED TRADITIONAL BIRTH ATTENDANT.....D</p> <p>COMMUNITY HEALTH WORKER.....E</p> <p>TRADITIONAL BIRTH ATTENDANT.....F</p> <p>RELATIVE/FRIEND.....G</p> <p>NO ONE.....H</p>	
23	<p>After (Name) was born, did any health care provider or traditional birth attendant check on (Name's) health?</p>	<p>YES.....1</p> <p>NO.....2</p>	
POSTNATAL CARE			
24	<p>What are the emergency signs to watch for after you have delivered your baby?</p> <p>(MORE THAN ONE RESPONSE POSSIBLE) RECORD ALL</p>	<p>VAGINAL BLEEDING.....A</p> <p>PAIN (abdominal).....B</p> <p>FEVER.....C</p> <p>FITS/CONVULSIONS.....D</p> <p>FOUL SMELLING VAGINAL DISCHARGE...E</p> <p>OTHERS.....F (SPECIFY)</p> <p>DON'T KNOW.....99</p>	
25	<p>What are the urgent referral steps you would take in case you experienced on or more of these emergency signs after delivery?</p> <p>(MORE THAN ONE RESPONSE POSSIBLE) RECORD ALL</p>	<p>CALL FOR HELP (transport, money).....A</p> <p>LAY WOMEN DOWN.....B</p> <p>COVER WITH BLANKET.....C</p> <p>OTHERS...D (SPECIFY)</p> <p>DON'T KNOW.....99</p>	

o.	Questions and Filters	Coding Categories	Skip
26	<p>If you experience bleeding after delivery what action steps do you take?</p> <p>(MORE THAN ONE RESPONSE POSSIBLE) RECORD ALL</p>	<p>RUB WOMB.....A</p> <p>HOLD WOMB WITH TWO HANDS/ APPLY PRESSURE.....B</p> <p>RUB NIPPLES, BABY TO BREAST.....C</p> <p>WOMAN PASS URINE.....D</p> <p>PUT CLOTHES BETWEEN LEGS.....E</p> <p>LIQUIDS EVERY HOUR.....F</p> <p>CONTINUE TO BREASTFEED.....G</p> <p>OTHERS _____.....H (SPECIFY)</p> <p>DON'T KNOW.....99</p>	
27	<p>If you experience pain or fever after delivery what action steps do you take?</p> <p>(MORE THAN ONE RESPONSE POSSIBLE) RECORD ALL</p>	<p>LIE DOWN IN SEMI_SITTING POSITION...A</p> <p>COVER WITH BLANKET.....B</p> <p>SPONGE BATH IF NEEDED.....C</p> <p>WOMAN PASS URINE.....D</p> <p>EMERGENCY TRANSPORT TO A HEALTH FACILITY.....E</p> <p>OTHERS _____.....F (SPECIFY)</p> <p>DON'T KNOW.....99</p>	
28	<p>If you experience Fits/Convulsions after delivery what action steps do you take?</p> <p>(MORE THAN ONE RESPONSE POSSIBLE) RECORD ALL</p>	<p>LIE ON LEFT SIDE.....A</p> <p>EMERGENCY TRANSPORT TO A HEALTH FACILITY.....B</p> <p>OTHERS _____.....C (SPECIFY)</p> <p>DON'T KNOW.....99</p>	
29	<p>If you experience fouds smelling vaginal discharge after delivery what action steps do you take?</p> <p>(MORE THAN ONE RESPONSE POSSIBLE) RECORD ALL</p>	<p>EMERGENCY TRANSPORT TO HEALTH FACILITY.....A</p> <p>OTHERS _____.....B (SPECIFY)</p> <p>DON'T KNOW.....99</p>	

Thank you for very much for participating in the survey