Assessing Acceptability of a Mobile Health Intervention:

SMS Maama Maternal Health Program in Kampala, Uganda

MPP Professional Paper

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Abstract

Purpose: This study examines the acceptability of SMS Maama, a mobile health (mHealth) intervention for maternal health in Kampala, Uganda. **Design:** A qualitative study was conducted with thematic analysis methodology to identify aspects that contribute to success in mHealth maternal health interventions in an urban setting in sub-Saharan Africa. **Method:** Focus groups were used with 30 women to examine perceptions of mHealth program structure design, patterns of seeking care, and knowledge of pregnancy. **Results:** Prominent themes addressed in groups include knowledge of pregnancy, healthy nutritional intake, program design, seeking care and information, and partner antenatal care (ANC) attendance. **Discussion:** Women responded positively to the design of the program and emphasized the need for a service that addresses their feelings of fear, confusion around nutritional information, and frustration with the logistics of attending ANC. **Policy Implications:** Even though mHealth is an increasingly popular modality of care, there is a lack of international policy guidelines and best practices necessary to run mHealth programs in maternal health in developing countries. **Conclusion:** SMS Maama is an acceptable model for literate women with access to mobile phones in urban settings in Uganda, and potentially other urban settings in East Africa.

Introduction

The state of maternal health care in Uganda is dire, with strains due to high birth rates and high maternal mortality, compounded by a lack of health-care professionals and poor access to medical care. Uganda's antenatal care (ANC) is among the poorest in the world with the current workforce availability only being able to meet an estimated 27% of clinical needs (UNFPA, 2012). Standard antenatal care is often neither available nor accessible. Given the strains women have in accessing and utilizing antenatal care, SMS Maama, a mobile Health (mHealth) education platform for pregnant mothers, was created to address the need for basic assessments, nutrition guidance, and screening for complications in Kampala, Uganda. Using focus groups, this study seeks to assess the acceptability of SMS Maama's mHealth program model for women in urban, private health care settings in Uganda, and potentially East Africa.

Background

Maternal Health and Antenatal Care in Uganda

Uganda has one of the highest total fertility rates in the world at 5.6 births per woman (World Bank, 2016), and a maternal mortality ratio of 343 deaths per 100,000 live births ranked 36th highest in the world (World Bank, 2015a). The median age at first birth is 19.4 for women aged 20-49 and is the same for women in the highest wealth quintile. Fertility rates are high for the entire population, ranging from four to six births per woman across wealth and education levels (ICF, 2016). This is concerning because having multiple births at an early age is a common contributor to maternal mortality.

Other contributors to maternal mortality include poor diet and inadequate access to a healthcare facility, which place women at risk for having prolonged labor and developing pregnancy complications that can lead to premature death (Ausen, 2017). The most recent data

from the Ugandan Demographic and Health Survey best illustrates the state of ANC for women aged 15-49 with a live birth in the past 5 years. Only 60% of Ugandan women made four or more ANC visits (UBOS, 2016), even though the WHO recently changed its guidelines from four to eight ANC visits per pregnancy (WHO, 2016). These visits are not only crucial for ensuring a healthy pregnancy but also serve as an opportunity for women to learn how to manage their pregnancy through discussions with a health professional. Of those who attend ANC, 93% have their blood samples taken, 89% received iron tablets or syrup, 88% are weighed, 72% have their blood pressure measured, and 39% have a urine sample taken (UBOS, 2016). Maternal mortality is also worsened by the lack of access to medical professionals. On average, there are only 0.09 physicians and 0.6 nurses and midwives per 1,000 people (World Bank, 2015b), which is far below the WHO recommendations of at least 2.5 medical staff per 1,000 people (Chen et al., 2006). A full provision of these services is essential for medical professionals to monitor and screen for complications, such as infectious diseases, anemia, and pre-eclampsia.

Mobile Health (mHealth)

Globally, there has been increasing development and application of mobile health technology for public health interventions and streamlining health care access and delivery. SMS Maama is modeled on previous mHealth program designs in other developing countries which have been shown to be effective in engaging participants in matters of their own healthcare. One example from Rwanda in 2009 is Rapid SMS, a text message (SMS)-based intervention to connect health workers and pregnant women which reduced the annual mortality rate in one hospital from ten to zero (Ruton et al., 2018). In Bangladesh, the Mobile Alliance for Maternal Action (MAMA) demonstrated that 69% of participating women reported attending four or more antenatal visits compared to only 32% nationally (Ahsan et al., 2013). In addition to these

programs, various randomized controlled trial studies conducted in Zanzibar, Kenya, and Nigeria using mHealth initiatives have shown promising improvements in maternal health care service utilization (Lund et al., 2012; Oyeyemi et al., 2014; Mushamiri et al., 2015). Overall, there has been a rapid increase in the number of programs and impact evaluation studies demonstrating the effectiveness of using mobile health for maternal health care interventions.

SMS Maama

SMS Maama is a University of Minnesota student-run business venture aimed at increasing access to maternal health information through a mobile health application. There are two phases of research that comprise SMS Maama pilot activities including 1) the main pilot study and 2) focus groups. From June 2017 to September 2018, SMS Maama conducted a pilot research study in collaboration with Benedict Medical Centre (BMC) entitled "SMS Maama mHealth Pilot Research Study", approved by the University of Minnesota Institutional Review Board (IRB).

Program Overview.

The program automatically sends three types of simple-language text messages to women looking for more information about their pregnancies. First, it sent informational texts on knowledge related to pregnancy, birth, and the post-partum period. Second, it sent ANC appointment reminders, which encouraged women to attend their ANC appointments and bring their partners with them to the clinic. Third, it sent yes/no screening questions to identify serious health conditions, link women to care if needed, and also educate them on pregnancy complication signs and symptoms for the future. Women are also incentivized to participate with the provision of points for interacting with text message questions, attending ANC appointments, and bringing their partner to appointments. These points could be redeemed for small baby gifts.

Lastly, participation in the program included the provision of a safe birthing kit, also known as a "maama kit", which a woman is required to provide for her delivery at the hospital. These kits are required because hospitals frequently lack adequate supplies (Ausen, 2017).

Inclusion Criteria.

The study excluded any women under the age of 18, those who did not own a mobile phone, were not patients of BMC, were not between 10-28 weeks pregnant, were not literate in English or Luganda, and/or were unable to send or receive text messages. These criteria apply to both the pilot study and focus group phases.

Pilot Program Phase.

The pilot program consisted of a partnership with Benedict Medical Centre and The Medical Concierge Group, both in Kampala, Uganda. This portion of the research enrolled 110 pregnant women in an SMS text message program and measured maternal health knowledge, platform feasibility, and user satisfaction to test the efficacy of its mHealth delivery system.

Focus Group Phase.

The focus group phase consisted of nine focus groups held with groups of 3-4 women at one time (N = 30) who were attending their antenatal care appointments at Benedict Medical Centre during July of 2018 but were not enrolled within the pilot study of the SMS Maama program. These focus groups gathered data to assess the acceptability of the program by women who were not directly benefiting from the pilot study but did represent the same target demographic and the same eligibility criteria as the pilot study.

Population Demographic Characteristics.

Demographic data collected from the pilot study participants was used to generalize for the focus group participants (see Table 1). This is because focus group participants were

recruited from the same setting and within the same year as the pilot study participants under the same inclusion criteria. There were also two limitations that made it difficult to collect demographic health information without sacrificing more time, creating a larger burden on clinic collaborators and participants. First, the focus groups were recruited from the group of women who were waiting for their antenatal care appointments, which allowed us to work with them in a room for no more than an hour at the request of the midwives who were principal actors in the recruitment process. This recruitment process was done in order to preserve a functional atmosphere, use only the time during which women were waiting to see the midwives and make sure we did not prolong or disrupt their appointments. Second, not collecting demographic data lessened the cognitive burden on the participants as much as possible, and limited the personal data collected on patients to maintain a stronger sense of anonymity and privacy. This structure allowed for more personal and in-depth questions about treatment by staff in hospital settings, their experiences with their partners, and other struggles they had during their pregnancy.

Due to the location of BMC, participants resided within the three different districts of Kampala, Mukono, and Wasiko, but primarily lived in Kampala. They tended to be between 20-30 years old, Christian (Catholic or Protestant), employed, had attended higher education, and lived in an urban residence. By virtue of the study's inclusion criteria, all were literate and owned a mobile phone.

To understand how the pilot study cohort differed in comparison to the population of women of reproductive age (15-49) within the three surrounding districts, a series of statistical significance tests were conducted to compare the pilot study cohort to the Uganda Demographic Health Survey (UDHS) individual women's dataset (UDHS, 2016). Table 2 presents the results of these tests, summarized by variables that were estimated to be most relevant to reproductive

health. The tests revealed that the pilot study sample is representative in terms of age and employment. However, the sample of women in the pilot study were more educated, urban, literate, and likely to own a mobile phone.

The results of these tests inform the extent to which one can generalize the data collected in the focus groups. These women's experiences are a good representation of the population in the three surrounding districts in issues related to age and employment status, which helps us to understand shared life course and work-related factors that influence experiences with pregnancy.

Theoretical Guides

The Three Delays Model was used as an analytical guide for grouping together reasons for not attending or seeking antenatal care. This model identifies three key areas that block access to maternal health. These include the first delay in deciding to seek care, the second delay in reaching care, and the third delay in receiving adequate health care (Thaddeus et al., 1994). The first delay in deciding to seek care can be due to low social status, lack of understanding of complications and pregnancy risk factors, or previous poor experience in a health care setting, a fatalist acceptance of maternal mortality, or financial limitations. The second delay in reaching care is due to the mother's distance from the clinic, lack of affordable and accessible transportation, poor roads or transportation infrastructure, or geographical obstacles such as mountains or rivers. The third delay in receiving care is due to poor-quality facilities characterized by a lack of medical supplies and staff, adequate training, motivation, or referral systems.

Methodology

Recruitment

The focus groups were recruited within the maternal care ward of BMC and conducted within one of two conference rooms. There were three key persons responsible for focus group recruitment and administration including an on-duty midwife, the focus group facilitator, and focus group recorder.

The facilitator and recorder coordinated with the on-duty midwife and set up for the focus groups, which were held in an administrative conference room within the clinic. The moderator worked with the midwife to recruit women who were checking in for their ANC appointments. Women were eligible to participate if they were not currently taking part in the SMS Maama pilot study, as indicated on their BMC antenatal card, and did not meet the aforementioned inclusion criteria. Midwives were trained to ask the women the following:

> *We are conducting a group interview for a mobile health (text messaging) social initiative called SMS Maama. Would you like to take part in the group interview while you are waiting? Because your knowledge and opinions are valuable, you will receive free food and drink as compensation during your wait.*

Once the midwife had at least three women (and no more than five) and brought them to the administrative room, they were welcomed by the recorder and facilitator and offered beverages and snacks.

Facilitation Structure

The facilitator then closed the doors and commenced the focus group session by welcoming all, introducing both focus group research personnel, and explaining the topic and purpose of the focus group by reading through the informed consent document with all the

women, and allowing them ample time to read through the document and ask any questions they had before the focus group began. The facilitator then collected the signed copy for SMS Maama to keep. All focus group participants signed two identical consent forms; one copy for SMS Maama, and the other for the participant to keep. Consent forms were provided in English and Luganda, but there was only one participant who required a Luganda consent form.

Each session lasted from around 45 minutes to an hour and was conducted in English by the primary facilitator with secondary facilitator taking notes, observing, and asking follow-up questions if needed. There were some instances where the focus group was temporarily translated into the local language of Luganda, but this was used primarily to clarify misunderstandings. There was one participant who only spoke Luganda and required a translator, which is discussed in-depth within the limitations section.

The facilitator followed a semi-structured interview guide designed to address the core research content areas (see Table 3). The questions included an ice-breaker, a free-listing exercise, and open-ended discussion questions organized by research content areas with follow-up probes to generate discussion. While the facilitator was responsible for guiding and talking with all focus group participants, the recorder would participate in the beginning and end when introducing herself, and when asking any follow-up questions to fulfill key content areas.

Data Collection and Analysis

Data was collected using a combination of tools. The answers to free listing questions were recorded in notebooks and collected by a secondary interviewer. All focus group notes, audio files, and transcripts were de-identified and backed up electronically through the University of Minnesota's Google Drive. Transcripts were created from the audio files by the recorder and reviewed by the facilitator for accuracy within four months of writing the date.

Notes taken during the session by the recorder were used to clarify tone or body language in transcripts. All data were imported into NVivo software for analysis.

Glaser's Constant Comparative Method (CCM) was used for the analysis of this study (1965). CCM coding guidelines for analysis (Strauss & Corbin 1990) were followed sequentially for each focus group question topic. For each topic, open coding was used to explore and identify broad patterns in how the respondents answered. Open coding consisted of reviewing the data at least three times to first code for the broad response patterns, then coding again to acquire word counts for specific mentions of social phenomena, such as a particular food, reiterated adjectives, or sentiment. Axial coding was implemented to further refine categories and themes created during open coding. This involved reassembling categories through the comparison of codes created across respondents and focus groups; and relabeling or regrouping concepts as needed. Finally, selective coding was used to apply summarizing themes that emerged after axial coding. These consisted of summarizing themes were used to compare trends across all focus groups by all the respondents and understand the social phenomenon at its broadest level.

Results

Results are organized by themes, which roughly mirror the discussion questions as presented in Table 3 but include subsections that further summarize the most salient themes of the responses. The results are summarized by the themes of knowledge of pregnancy, healthy nutritional intake, program design, seeking care and information, and partner ANC attendance.

Knowledge of Pregnancy

Pregnancy Complications.

Women listed death as both the top perceived risk and their top personal fear during pregnancy (see Table 4). Aside from death, the top perceived risks included complications and

illness, whereas their top personal fears focused more on aspects of pain when discussing vulnerability and complications.

Healthy Nutritional Intake

Nutrition.

Women were asked what foods they considered best for the baby, and the results are summarized in Table 5. When discussing what kinds of foods were the most nutritious for fetal development, the most common foods mentioned were “greens”, followed by starches, meats, fruits, dairy, and legumes. When discussing what kinds of food qualities were healthiest for fetal development, there was frequent mention of proteins and carbohydrates for nutrients; and vegetables and fruits for food groups, as well as foods that contained iron.

Cravings and Aversions.

Every discussion reported that cravings varied throughout their gestational period and that what they craved varied month to month (see Table 6). Many women reported only being able to eat one kind of food without feeling sick. Although they were not explicitly asked about foods that caused nausea or disgust, women were inclined to discuss foods that resulted in nausea, vomiting, or loss of appetite. When women claimed to like and crave junk food, the room would laugh in agreement, suggesting that most women have cravings for junk food.

Despite receiving warnings from many different sources around eating junk food, every group had women claiming that cravings and temptations often overshadowed any advice they had received from people, but that they would still try to minimize the amount of “bad” food that they ate as a precaution. As one woman put, “if you want it you cannot stop yourself”.

Myths and Beliefs.

There was an immense sense of unease and worry about what they should and should not be eating, even when they admitted that they know they should follow the advice of a health professional. This struggle is aptly summarized by one woman's experience navigating between different sources of advice about food as a "tug of war", and that she felt consistently discouraged by people's advice.

One of the most salient themes was pica, which is the craving and intentional consumption of non-food substances. Within these focus groups, the most common forms of pica were referred interchangeably without distinction as black soil, clay, burnt clay, soda ash, charcoal, and *mumbwa* (the Lugandan word for bars of clay), which was discussed in-depth for two of the groups and mentioned in two others. Seemingly all women were familiar with the substance when it was brought up. Many seemed to have tried it even though they knew they were "not supposed to." Many women reported strong cravings, had eaten it, or knew someone else who had eaten it. Some claimed that it provided iron and minerals to the body but were aware that it could cause complications and had either stopped or tried to reduce how often they ate it. In one session, one woman even took it out of her bag, which caused a delighted reaction from the other members of the group. Even though she knew it was harmful and warned other group members of its bad qualities, she still carried it with her because the cravings were so strong.

While it was common knowledge that sweets like candy and cakes were not generally healthy, carbohydrates like maize, porridge, and milk were said to cause digestion and labor issues or cause the mother and/or baby to grow too fat and result in painful, prolonged labor.

Sometimes the idea of sweets being bad was extended to all fruits in general, like bananas or other fruits.

Yellow and orange fruits were common fruit about which there was misinformation. Often mentioned in the same context were pineapples, bananas, and oranges, as well as one mention of jackfruit and ginger. The reasoning was that because pineapples and bananas cause children to over-salivate in their infancy, women should avoid eating them in the later trimester. As one woman humorously explained, "when someone finds you eating a whole pineapple, [laughter] they're like, 'do you want to kill your baby?" One woman said she had heard that anything acidic could cause miscarriages, and other women supported these claims using pineapples and oranges as examples. Other women in the groups validated these claims by saying they had heard these myths or advice from friends and family, even though they were not clear on why or how they caused harm.

There were a notable number of women who had received advice that drinking too much water could be harmful. Two women in one group had heard that drinking too much water results in more intense labor pain. This was deemed to be problematic for women who work physically demanding jobs or experience an increase in thirst due to their pregnancy but had a hard time deciding how much water they should be drinking.

Program Design

The following themes illustrate aspects of the program design to which women reacted and ways that they suggested the program could be beneficial or improved.

Phone Ownership and Sharing.

There seemed to be a group consensus on the fact that even though they almost always had access to a working phone, their mobile telephone networks were often unreliable, regardless

of the brand. While all women had verified that they had their own mobile phones, there were two women who noted that they sometimes share their phones with their husbands.

Women indicated that they almost always had their phone active, charged, except for rare occasions when the power or electricity was not working in their home. About half of all women mentioned that they rarely had problems with not being able to afford airtime, the longest time frame mentioned was only up to four days at a time. Most women did not load their phones on a daily basis or had technical issues trying to use mobile money to buy airtime.

Texting Platforms and Applications.

A common theme across groups was that many women prefer receiving messages through WhatsApp, an online application that a large part of the world uses in lieu or in addition to SMS text messaging. One woman concisely summarized the experiences and ideas of those who prefer the WhatsApp platform and are already frequently use messaging platforms.

> *I' like discovering, so for me, however much they send messages because I'm always on messenger, Facebook, WhatsApp, and you're answering thousands of messages from friends and it keeps you busy at night, I enjoy that… so if you said 10 times a week, for me I think I'm flexible, as long as I can learn something from it."*

The way women report using messaging platforms is consistent with social media trends in broader Africa (Pindayi, 2017), as well as literature on how women are using mobile internet in their everyday lives (Bailur & Masiero, 2017).

Frequency, Number, and Types of Text Messages.

When women were asked about how often they would like to receive text messages, there was often unprompted lively discussion around not only the frequency, but the type of messages women would like to receive. There were a few women who reported only wanting to receive

one message per week, or who did not want to be interrupted by notifications during working hours. Including those who only wanted to receive one message per week, the majority of women seemed to prefer having daily texts sent to them, provided that messages were educational, providing new information every time.

Support Through Reminders.

Often tied to this desire for knowledge and education was also the need for reminders about appointments, what vitamins and drugs to take, and what exercises they should do. One group had a woman who talked about how her friend was enrolled in a program similar to SMS Maama, and how their reminder system not only benefited both her and her friend.

Usefulness for Sensitive issues.

Other aspects that women perceived to be beneficial about the program was the ability to receive education and support through text messages and the ability to seek counsel on sensitive issues when they might be hesitant to ask a health professional in person. One woman shared a story about a friend who delayed seeking care for her STI during pregnancy out of fear and shame, which resulted in a strong positive response from the rest of the group members. There was enthusiastic agreement that having support through text messages could help in a time of need for issues like this.

Midwife Follow-Up.

Every woman in all the focus group sessions indicated that they would like it if a midwife followed up with them every time they indicated that they had a complication. Even women who were otherwise non-verbal indicated through short affirmations or overt body language that they agreed with other women. Various women described how it would make them feel “proud,” “the happiest” if a midwife called them and could help them “make new friends”. To be sure of these

overwhelmingly positive answers, the facilitator and note taker made sure to ask if anyone disagreed, or if anyone would find a midwife follow-up call intrusive or annoying. No one indicated anything contrary to the consensus, which was unusual given that women were often willing to provide an opposing viewpoint when asked.

Points or Money as Participation Incentive.

The consensus from women was that they would feel more incentivized to respond to a text message if they knew that they were receiving points, money, or gifts for doing so. Even when participants considered whether or not they would have to pay the normal text messaging rates for responding, there were no participants who indicated that they would be less likely to reply. One woman pointed out that she would be trying to learn information on the internet anyways, so it made sense to do so in a way that offered her rewards.

There was no discernable consensus in sessions on whether points, money or physical gifts were preferable over one another as participation incentives. The question also seemed to confuse some participants without having a more specific idea of how much they could earn. Most women indicated that they needed to know more specific information, such as what kind of gifts they could earn, and their relative value. Regardless of whether they were to earn points or money, an overwhelming majority of the women would prefer to spend money or earn gifts exclusively for their baby.

Two other women said that they would apply the money they earned towards paying for internet bundles and basic mobile phone utilities, and one also creatively indicated that she would invest the money in throwing a baby shower to get more items for her baby. Out of those who preferred earning points over money, one of the most salient reasons was because they wanted to make sure that they did not accidentally spend the money elsewhere.

When women were asked if earning points for bringing their partner to an antenatal clinic appointment would incentivize them and their husbands to attend, no women indicated that they thought it was a bad idea, but many took the opportunity to make a joke that they had already tried to bring their husbands with them and that having one more incentive would make little difference:

Facilitator: How about if you earned a point every time you brought your partner with you to antenatal? [Laughter]

Woman 1: Ahhh, right.

Woman 2: That's also not bad…

Woman 1: It's good, but you know what it takes to carry a man to the hospital to come for antenatal every time he is supposed to come.

Woman 3: Every time!

Woman 1: He can't even come once to be like this, just to give you courage to keep on coming to the hospital. But bringing him on a daily basis when you're supposed to come, it's very hard.

Facilitator: But what if you knew that you would earn a point?

Woman 1: But would you chain him? You can't! Just let the point go.

[Group laughter]

Besides those that responded passionately to the question with humor or exasperation, there seemed to be ambivalence or indifference, stating that it would not make a difference because it was out of their control, or that they had a partner who already was attending regardless of any point incentives.

Seeking Care and Information

Sources of Pregnancy Information.

As reported in Table 7, women reported getting health information most frequently from medical sources; hospitals, medical centers, and the medical staff were the most mentioned sources of health information; the internet was the second most common source of health information. When specifying which sources were used, they often indicated social media. In discussing the types of nutritional advice that women received from various sources, they found the most confusing sources to be what they read on the internet, what they learned from friends, family, and colleagues, and occasionally from midwives and doctors, especially if it was contradicting what was being said by other sources.

Calling the Clinic.

About half of the women noted that they might call the clinic if they had already established that the clinic was receptive and willing to help. In one group, all three of the women said that they had called before and felt that it had been useful for answering quick, logistical questions. This same sentiment was echoed in other focus groups who validated that once they make contact over the phone, they are more likely to call again in the future knowing that there is a specific health professional like a trusted doctor or a midwife on the other end.

For the other half who simply stated that they had not nor would not think to call a clinic, it was often due to a lack of knowledge about who specifically to call. There seemed to be a preference for calling an individual that they trusted, such as a friend or trusted doctor, rather than an anonymous number, especially in the face of a scary complication that required immediate decision making.

Common Barriers to Attending ANC.

The most frequently mentioned delays in attending ANC are summarized in Table 8. The most common reason women gave for not wanting to attend antenatal clinics was the fear of mistreatment by medical professionals. Even though many women indicated that the midwives and doctors at BMC were kinder than professionals at other clinics, many women had heard enough stories from other people or had experienced enough rude treatment for it to make an impact. The second and third most discussed reasons for not attending ANC were due to finances and work, which were often discussed in terms of how exhaustion, low funds, distance to travel to the clinic, and feeling a lack of support both at home, work, and at the clinic.

Partner ANC Attendance

Discussions surrounding partner ANC attendance varied from lengthy and complex to short and straight-forward. Summarized in Table 9 are the explanations for why or why not their partners want to attend ANC, as well as reasons for women's preferences.

Work and Distance.

Partners often work far away during the week and cannot physically attend. Other times, they are so busy that it is logistically difficult to plan an ANC visit with him. Women most often indicated that their partner might be able to attend when there is a problem or an emergency. However, about half of the women who indicated that their husbands could not attend ANC claimed it was due to work and schedule conflicts, and the other half felt as though their partners used their work as an excuse to not have to involve themselves in ANC.

Lack of Comfort.

There were also a number of women who indicated that their husbands were not invested in her experience due to being fearful of death, HIV tests, or were uncomfortable being at the

clinic due to the lack of men and the perceived feminine environment of the antenatal clinic. In one focus group in particular where only women were present, all three women came to a strong consensus that men lack sensitization towards women's health issues and that it is in Ugandan and a broader African culture that men should not concern themselves with these issues.

Women's Preference for Partner ANC Attendance.

Support and Protection.

The most common reason women gave for wanting a partner to attend was they could have emotional support and protection that comes from escorting them, being present in case there was a complication, and helping them to remember important facts and details. Some women claimed that traveling to the clinic made them feel vulnerable because society treats pregnant women poorly, saying:

> *"Woman 1: It encourages me to go when I'm with my partner because there is a way society just treats pregnant women. I don't know about other countries, but I experienced it here in Uganda. Maybe they will cut you off, or even just the words they will say to you in a taxi or a boda. And they treat you so badly…*
>
> *Woman 3: They have this way of going around and making you feel vulnerable."*

By having their partner present with them, they claimed to feel a stronger sense of security when traveling from their homes to the clinic.

Money and Power Dynamics.

When talking about finances and money, some women felt that their partners were primarily concerned insofar as the costs they had to bare for antenatal care and providing goods, and only what happens after the delivery of the baby. In two separate focus groups, women brought up how having their husbands attend antenatal care can increase their decision-making

power about when and how to spend money on the pregnancy and baby. One woman said, “there are things that [doctors and midwives] may tell you, and it would be better if he is there. If you go and explain yourself, he may not understand or take it seriously the way he would have if he was there or face to face with the doctor, so I think it’s very important.” Having a medical professional explain to her needs to her partner can legitimize spending money on baby supplies, purchasing healthy foods, and reinforce the legitimacy of her needs. When these areas were discussed there was often a strong reaction from the group, which generated more intense and lengthy discussion.

Partnership.

Some women expressed that there was a partnership between them and their husbands and that their husbands attended ANC because they want to know more about pregnancy. Often the women who had partners who attended did not elaborate on their reasons for why they did or did not attend, but made simple statements like “it’s best”, or “of course [he attends].” There was only one woman who referred to their desire to have her partner attend as congruous with their own partner’s desires, claiming that “he also wants [to attend] ... and secondly, I would also want him to learn these things… because we are in this thing both of us.”

Not Worth the Effort

Among the women who did not want their partner to attend, most indicated that although it would be ideal if he attended, it was too difficult to coordinate around his work schedule, or she did not want to go through the effort of convincing him. Only one woman seemed to genuinely prefer that he not attend, stating that “It’s too strict… I just want that freedom of coming alone. I do my thing, and I go back home… and he comes back during the weekends and... I explain it to him.”

Discussion

When holistically examining focus group responses to assess acceptability, responses revealed important content that would increase acceptability, as well as an assessment of program design. Overall, the acceptability of the program hinges on providing relevant educational content on commonly misunderstood nutrition topics and providing emotional reassurance in the face of lack of support, fear, and stress that pregnant women endure. This means particular attention should be paid to not just the content of the messages, but the tone.

Given that women are already using the internet and soliciting people they trust to help them, creating a similarly accessible source on the same platform that provides accurate, medically informed and simple content would most likely be acceptable. Additionally, the option to call or text for medical counsel can meet the emotional and psychological needs of women in the face of the antenatal care hurdles of fear of mistreatment or inability to commute. While text message subject matter was not included as a question in the interview guide, almost every group mentioned that they appreciated receiving educative messages and that the quality of the content of these messages was essential to justifying the frequency with which they were sent.

Internet and mHealth to reduce delays.

Due to delays in seeking care, women often rely heavily on the internet to bridge the gap between professional care and advice from people they know. Because there was a lack of specific web sources and applications that were mentioned, and the frequent mention of using social media to educate themselves on their pregnancy, this is a good indication that SMS Maama fills a wanted and needed gap in through mHealth education. The high interest in the program is also consistent with a recent pilot study on mobile to access maternal health

education in eastern rural Uganda, where 98% of women reported being interested in receiving maternal mobile health lessons (Roberts et al. 2014).

Option for Web-Based Messaging.

Using WhatsApp is advantageous in that its users can send and receive messages over WiFi and data, which can sometimes be cheaper than paying to send and receive text messages. One of the benefits was that many women were already using WhatsApp. This is consistent with DHS data, which indicates that 82.2 % of women in Kampala, and 89.9% of urban residents own a phone (UDHS, 2016). However, using WhatsApp may alienate those who cannot afford data plans. A program that allows users to choose their platform is ideal for maximizing the number of positive user experiences and including as many participants as possible across various levels of technological access.

A mHealth program that allows the user to choose their preferred method of interaction is important for allowing women to access messages in a way that is most affordable. Allowing to choose between WhatsApp would allow users to not have to worry about the cost of sending messages since they could theoretically use WiFi.

Financial Incentives.

It is unclear and worth conducting more research on what types of incentives are most helpful in encouraging women to seek care. While there was no evidence to suggest that financial incentives were bad, many women seemed confused about the logic of incentive structures in the focus groups. Thus, it is important to establish how a clear incentive structure will allow women to more intuitively interact with the program.

Frequency of Messages.

Women indicated that they were willing to receive up to multiple daily messages so long as this information is varied and educational. One useful feature would be for women to opt-in for limited messages if they preferred so as only to receive weekly messages. Given what was said in the focus groups about the importance of feeling a sense of support, this suggests that it would be better to provide more SMS content rather than less. Overall, this confirms what already exists in the literature about text messaging interventions, which is that daily to weekly messages tend to be preferable (Hall et al., 2015), but there is little published on the effect of daily or weekly messages specifically for antenatal mHealth programs in Uganda. Overall, women indicated that they want support not just for education, but for counseling, appointment reminders, and personalized care that they can access when they are feeling too scared or vulnerable to seek help in person.

Engaging Partners to Reduce Delays.

The results do not indicate if providing financial incentives would encourage women's partners to attend ANC. It is clear that most women prefer having their partners attend because it provides them with support and empowers them, and that work is the primary reason why partners do not attend as well as a lack of comfort in maternal health clinics. It is possible that involving partners in the program with educational text messages could provide them with small financial incentives, could stimulate interest in pregnancy issues, and encourage attendance. There is literature to suggest that men have an interest in mobile health education programs but cannot attend antenatal programs due to work or because they feel uncomfortable in women-dominated spaces (Donovan & Whitten, 2015), but it is unclear if this extends outside the United States to Uganda. However, Roberts et al. reported that 100% of the 42 men surveyed in four

villages across rural Eastern Uganda were interested in receiving maternal mobile health lessons (2014). These results suggest that this study's findings are consistent with male interest in learning antenatal care but are unable to due to work and gender norms.

Emotional and Logistical Support.

Providing basic emotional validation and support was one of the strongest themes that emerged across conversations topics and groups. While maybe one of these aspects was not strong enough by itself, multiple factors at once may disincentivize women from attending ANC. While various factors that contributed to delays were mentioned, such as work, lack of transportation, or lack of funds, the biggest reason for not attending antenatal care was the fear of mistreatment by medical professionals. This pattern is well-documented in the literature on maternal health care in Uganda. Health units are often considered as only a last resort when there are complications (Kyomuhendo, 2003). This is not only due to lack of skilled staff and supplies, but complaints of poor treatment by hospital staff. Women report being abused or neglected, not understanding the reasons for their procedures, and complain that health workers tend to view them as ignorant or stupid (Kyomuhendo, 2003; Anastasi et al., 2015). Women also overwhelmingly report fear of physical or emotional abuse by health care workers, including scolding them for traditional practices or physically assaulting them, and that this is often due to cultural differences and negative stereotypes (Kwagala 2013; Finlayson & Downe, 2013).

When comparing the top issues faced in pregnancy to their personal fears, the psychological and mental burdens ranked higher than worries of physical ailments. The desire to have more emotional support to navigate the complexities of pregnancy and antenatal care was present in nearly every content area discussed during the focus groups. Women want support not

just for education, but for counseling, appointment reminders, and personalized care that they can access when they are feeling too scared or vulnerable to seek help in person.

These results reaffirm how counseling and education on maternal health is often lacking in health care settings. Ayiasi et al. speculate that this is largely due to the fact that staff are more inclined to offer clinical services in lieu of health education or counseling (2015). Other qualitative research by Ayiasi et al. that shows health education is provided in terms of a top-down information transfer, as healthcare workers are not trained to counsel or educate (2013).

Knowledge of Complications and Fear of Pain and Death.

There seems to be a difference in how women perceive risk in pregnancy, what they know is most likely to happen, and what they are most personally afraid of. The top perceived risks appear to be more clinical in nature, relating to specific complications. Even when describing issues of "vulnerability", they tend to describe the general poor quality of care or lack of resources. However, when describing their personal fears there was a larger emphasis on psychological issues such as pain, stress, discomfort, or being mistreated by their midwife. When describing complications, cesarean sections were mentioned ten times in the fears section in comparison to only once in the risk section.

This is consistent with Conrad et al.'s research showing that health education services at antenatal care visits are often of poor quality and poorly retained by the attendees (2012). Midwives did not have a systemic way of making sure each client received all relevant information, as education settings were often conducted in groups, and topics varied day to day. As a result, women could not describe components of good pregnancy nutrition, or recognize danger signs of a pregnancy. The counseling around antenatal health is also poor, as women

often had poor levels of knowledge on pregnancy-related topics, except for information related to HIV (2012).

Nutrition.

Based on discussions surrounding nutrition and diet, there were some key areas that would be worth emphasizing in SMS Maama's educational content. There was also an overemphasis on protein as an important macronutrient for a healthy pregnancy. Women mostly emphasized foods that give that provide "energy" and "bulk", but the only nutrients that were explicitly mentioned were iron and protein. Emphasis on particular nutrients should include folate/folic acid, water, and pica.

There is a particularly dangerous dissonance between what women crave, what they perceived to be nutritious and the nutrition myths that surround them. In particular, affordable and accessible sources of folate/folic acid often had myths surrounding them that could make women less likely to consume them, such as porridge, cereals, and citrus fruits. Moreover, women reported more cravings and less nausea with starches and fruits over any other food group. Given that no women mentioned folate/folic acid as an important nutrient, and that common sources of it were stigmatized even though they craved them, it is crucial that women receive accurate and encouraging information on the importance of consuming the nutrient.

There was a commonly touted myth amongst groups that drinking too much water could be harmful. Thus, it is important to encourage women to drink water, especially since women are often working while they are pregnant. This myth seemed to house the most potential for danger and demonstrates that the most basic needs need such as thirst need validation and medical legitimization.

It is also important to focus on helping women to find alternatives to pica, given that its use is well-documented throughout Uganda, sub-Saharan Africa, and the world. Pica is theorized as a reaction to not getting enough adequate nutrients in one's diet, but the myths on its benefits as well as harms are numerous and confusing even to the women who discussed them in groups. Directly addressing this issue is important for not only limiting the intake of harmful substances but helping women to understand why they might be craving ash, clay, or dirt and provide alternatives to remedy it. However, education on pica in a Ugandan context is poorly understood in public health literature, with the most recent study on this specific topic dating back over two decades (Abrahams, 1997). While pica is a global phenomenon, understanding local patterns is essential to addressing it in health intervention.

The aforementioned results on nutrition contribute to the literature on patterns in antenatal nutritional myths in Uganda, as the topic is under researched and poorly documented in academic literature, particularly in how specific myths contribute to particular nutrient deficiencies. One study in Northern Uganda found that myths restrict consumption of animal-sourced foods and some green vegetables (Muggaga, 2017). Additionally, in the Ministry of Health Guidelines on Nutrition in Uganda, they urge medical professionals to refute and educate against them as they appear. While specific types of myths vary tremendously by region, understanding the most common myths and beliefs is essential to dedicate resources to educating on myths that have the potential to be especially harmful.

Generalizability and Limitations

In conducting the study, there were some limitations that influence the generalizability of the results. These include the focus group size, English-speaking inclusion criteria, and the focus

group facilitator and moderator's backgrounds and their effects on willingness to disclose information.

Focus Group Size

Small focus groups were used lieu of larger groups due to the restraints on recruitment within the clinic. This may have made the conversation more difficult to begin in the beginning, and made the setting feel more intimate. Capturing a group consensus proved to be more difficult with smaller groups, where women could be hesitant to contribute unless prompted, or hesitant to disagree unless asked directly. To remedy this, the facilitator deferred to quieter group members when appropriate or asked participants if they had any differing or agreeing viewpoints or similar/dissimilar experiences.

English-Speaking Inclusion Criteria

There may have been some individuals who were excluded from the study because they did not speak English. For the first focus group, there was one individual who was recruited to join the focus group but did not speak English. This was due to a misunderstanding by the midwife about eligibility criteria. Because the woman was eager to participate and had already been offered refreshments, the researchers concluded it would do more harm to exclude her from the focus group, even if she would not be able to fully participate. This was a risk because it required the midwife to serve as her translator, which could possibly cause women to withhold negative experiences that they had about midwives. Ultimately, the midwife only translated a couple of contributions by the woman, before the participant received a phone call and left unexpectedly. There ended up being no other eligible participants who could not speak English.

Reflexivity and Researcher Presence

Lastly, the researchers included a Ugandan male study coordinator who led the facilitation and coordinated with the midwives for recruitment, a Ugandan female doctor who facilitated one focus group, and a white American female graduate student who recorded the sessions, took notes, transcribed and analyzed the data in partnership with the study coordinator. There is a possibility that the presence of a male or the presence of a white American female might have led to the participants disclosing less information. The researchers attempted to remedy this by building rapport with participants before the session and consistently validating and emphasizing the confidentiality and the value of their thoughts and contributions.

Policy Implications

Literate women with access to mobile phones are already using the internet to educate themselves and seek support during their pregnancies. It is imperative that health programs adapt to this rapidly changing landscape to provide services that accommodate women through technology that they use in their everyday lives. With the creation of mHealth programs on the rise, it is important that international health organizations and policymakers continue to provide leadership in establishing evidence-based models, policy, and guidance.

With the field of mHealth having significantly grown over the past decade, pilot programs are now aiming to scale up. Such involvement requires an evidence base for making policy decisions on specific program designs. Even though research on scaled up mHealth interventions is limited, a review by Chen et al. revealed that while mHealth interventions tend to have a more beneficial impact than baseline care, “almost half (43%) of RCTs showed negative or unclear results on mHealth interventions” (2018). This presents a challenge to policy makers who require a more thorough understanding of the costs and benefits of implementing mHealth

programs in the long run. For example, Abejirinde et al. argue that future evaluations of mHealth programs for maternal health should include explanatory models of how and for whom the programs work, and in what contexts (2018).

However, there are some guidelines for enhancing mHealth programs through policy making. For successfully scaling up mHealth models, the WHO recommends integration with government Ministries of Health and/or private partnerships with mobile network operators (MNOs) and other technology companies (2015). Any collaborations in the private sector will require a focus on how MNOs can financially benefit in addition to providing low costs to users (WHO, 2019). MAMA learned from its multiple country programs that in addition to private partnerships, government involvement was important to program success by connecting programs to broader health and technology infrastructure and enhancing legitimacy and reputability (2016). The nature of these partnerships varied from close relationships in Bangladesh and Nigeria, moderate engagement in India, and only information-sharing in South Africa (2019).

Moreover, involving government and MNOs as stakeholders creates opportunities for policy that can benefit program participants. Governments possess the ability to provide tax breaks as incentives for companies to engage in corporate social responsibility initiatives. In its guide for engaging with MNOs, the WHO emphasizes that governments should provide corporate investment for new investment in technology, especially since short technology life cycles require expensive updates (2019b.). Leveraging government funding for requiring socially responsible engagement in the form of price discounts with mHealth programs can be an effective policy tool for strengthening mHealth systems.

Lastly, national governments have an obligation to create a policy environment that reduces technological hurdles and barriers to accessing care and protects consumers. First, regulation of the management of user data is crucial to ensuring privacy. While the WHO suggests creating mechanisms to allow users to opt out of services, it is also important to consider who stores, owns, and manages user data, especially when collaborating with the government or MNOs (2019). Second, governments have a duty to reduce communication barriers that place the cost burden on users. In the spring of 2018, the government of Uganda levied a social media tax of 200 shillings per day in an effort to prevent online "gossip", which may have contributed to the 2.5 million drop in internet subscriptions to social media services in the three months afterwards (Ratcliffe & Okiror, 2019). Given the popularity of social media like WhatsApp in Africa (Pindayi, 2017), governments have a responsibility to reduce barriers to accessing communications, which can allow health initiatives to successfully implement technological advancements in their program design.

Conclusion

SMS Maama is an acceptable model for literate women with access to mobile phones in urban Kampala, and potentially other urban settings in East Africa. The program design meets the needs of women who are already using mobile phones to educate themselves on pregnancy, but would be strengthened by allowing platform customization, and emphasizing the ability to access counsel or a medical professional when needed. Most importantly, program content must address women's fears directly and provide them reassurance through tone as well as emphasizing common nutrition knowledge gaps such as folate/folic acid, drinking water, and pica. Along with the results of the pilot study, these findings will be used to inform the design of future iterations of the SMS Maama program, and serve as comparison to participant survey

results in the pilot study. Further areas for research and consideration include establishing best practices in mHealth program design for maternal health, nutrition myths, and specific mHealth programs geared towards educating and engaging male partners.

References

Abejirinde, I. O. O., Ilozumba, O., Marchal, B., Zweekhorst, M., & Dieleman, M. (2018). Mobile health and the performance of maternal health care workers in low-and middle-income countries: A realist review. International journal of care coordination, 21(3), 73-86.

Abrahams, P. W. (1997). Geophagy (soil consumption) and iron supplementation in Uganda. Tropical Medicine & International Health, 2(7), 617-623.

Ahsan, A., & Raihan, A. (2013, December). Understanding mHealth impact among Aponjon (MAMA Bangladesh) subscribers through a phone survey in Bangladesh. In *Proceedings of the Sixth International Conference on Information and Communications Technologies and Development: Notes-Volume 2* (pp. 1-4). ACM.

Ausen, Sonja. (November 7, 2017). SMS Maama mHealth Pilot Research Study Proposal (Master's thesis). Retrieved March 3, 2019, from http://www.epi.umn.edu/mch/abstract/sms-maama-mhealth-pilot-research-study-proposal/.

Ayiasi, M. R., Van Royen, K., Verstraeten, R., Atuyambe, L., Criel, B., Garimoi, C. O., & Kolsteren, P. (2013). Exploring the focus of prenatal information offered to pregnant mothers regarding newborn care in rural Uganda. BMC Pregnancy and Childbirth, 13. https://doi.org/10.1186/1471-2393-13-176

Ayiasi, R. M., Kasasa, S., Criel, B., Garimoi Orach, C., & Kolsteren, P. (2014). Is antenatal care preparing mothers to care for their newborns? A community-based cross-sectional study among lactating women in Masindi, Uganda. BMC Pregnancy and Childbirth, 14(1), 1–11. https://doi.org/10.1186/1471-2393-14-114

Bailur, S., & Masiero, S. (2017). Women's income generation through mobile Internet: A study of focus group data from Ghana, Kenya, and Uganda. Gender, Technology and Development, 21(1-2), 77-98.

Chen, H., Chai, Y., Dong, L., Niu, W., & Zhang, P. (2018). Effectiveness and appropriateness of mHealth interventions for maternal and child health: systematic review. JMIR mHealth and uHealth, 6(1), e7.

Conrad, P., De Allegri, M., Moses, A., Larsson, E. C., Neuhann, F., Müller, O., & Sarker, M. (2012). Antenatal care services in rural Uganda: Missed opportunities for good-quality care. Qualitative Health Research, 22(5), 619–629. https://doi.org/10.1177/1049732311431897

Donovan, E., & Whitten, P. (2015). Including men in prenatal health: the potential of e-health to improve birth outcomes. Telemedicine and e-Health, 21(3), 207-212.

Glaser, B. G. (1965). The constant comparative method of qualitative analysis. Social problems, 12(4), 436-445.

ICF, 2016. The DHS Program STATcompiler. Funded by USAID. http://www.statcompiler.com. [April 24, 2019].

Kyomuhendo, G. B. (2003). Low Use of Rural Maternity Services in Uganda : Impact of Women's Status, Traditional Beliefs and Limited Resources Source: Reproductive Health Matters, Vol . 11 , No . 21 , Integration of Sexual and Published by: Reproductive Health Matters (RHM), 11(21), 16–26.

Kwagala, B. (2013). Birthing choices among the Sabiny of Uganda. Culture, Health and Sexuality, 15(SUPPL.3). https://doi.org/10.1080/13691058.2013.799232

Lund, S., Hemed, M., Nielsen, B. B., Said, A., Said, K., Makungu, M. H., & Rasch, V. (2012). Mobile phones as a health communication tool to improve skilled attendance at delivery in

Zanzibar: a cluster-randomised controlled trial. *BJOG: An International Journal of Obstetrics & Gynaecology*, *119*(10), 1256-1264.

MAMA Lessons Learned Report. (2019). Maternal Child Survival Program. Retrieved 16 May 2019, from https://www.mcsprogram.org/resource/mama-lessons-learned-report/

Muggaga, C., Ongeng, D., Mugonola, B., Okello-Uma, I., Kaaya, N. A., & Taylor, D. (2017). Influence of Sociocultural Practices on Food and Nutrition Security in Karamoja Subregion of Uganda. Ecology of food and nutrition, 56(5), 424-447.

Mushamiri, I., Luo, C., Iiams-Hauser, C., & Amor, Y. B. (2015). Evaluation of the impact of a mobile health system on adherence to antenatal and postnatal care and prevention of mother-to-child transmission of HIV programs in Kenya. *BMC Public Health*, *15*(1), 102.

Oyeyemi, S. O., & Wynn, R. (2014). Giving cell phones to pregnant women and improving services may increase primary health facility utilization: a case–control study of a Nigerian project. Reproductive health, 11(1), 8.

Pindayi, B. (2017). Social Media Uses and Effects: The Case of WhatsApp in Africa. In Impacts of the Media on African Socio-Economic Development (pp. 34-51). IGI Global.

Ratcliffe, R., & Okiror, S. (2019). Millions of Ugandans quit internet services as social media tax takes effect. the Guardian. Retrieved 16 May 2019, from https://www.theguardian.com/global-development/2019/feb/27/millions-of-ugandans-quit-internet-after-introduction-of-social-media-tax-free-speech

Ruton, H., Musabyimana, A., Gaju, E., Berhe, A., Grépin, K. A., Ngenzi, J., ... & Law, M. R. (2018). The impact of an mHealth monitoring system on health care utilization by mothers and children: an evaluation using routine health information in Rwanda. *Health policy and planning*, *33*(8), 920-927.

Strauss, A. & Corbin, J. (1990). Basics of Qualitative Research: Grounded Theory Procedures and Techniques. Newbury Park, CA: Sage Publications.

Thaddeus, S., & Maine, D. (1994). Too far to walk: maternal mortality in context. *Social science & medicine*, *38*(8), 1091-1110.

Uganda Bureau of Statistics (UBOS) and ICF. (2017). Uganda demographic and health survey 2016: key indicators report. *Kampala, Uganda*.

Uganda Demographic Health Survey 2016 [Dataset]. UGIR7HFL.DTA. Calverton, Maryland: Uganda Bureau of Statistics and ICF International Inc; 2018.

United Nations Population Fund (UNFPA). (2012). Uganda. Retrieved March 25, 2015, from https://www.unfpa.org/data/sowmy/UG#

World Bank. (2016). Fertility rate, total (births per woman). Retrieved March 03, 2019, from https://data.worldbank.org/indicator/SP.DYN.TFRT.IN?locations=UG&year_high_desc=true

World Bank. (2015a.) Maternal mortality ratio (modeled estimate, per 100,000 live births). Retrieved March 03, 2019, from https://data.worldbank.org/indicator/SH.STA.MMRT

World Bank. (2015b.) Physicians (per 1,000 people). Retrieved March 24, 2019, from https://data.worldbank.org/indicator/SH.MED.PHYS.ZS

World Health Organization. (2015). The MAPS toolkit: mHealth assessment and planning for scale. World Health Organization.

World Health Organization. (2016). WHO recommendations on antenatal care for a positive pregnancy experience. World Health Organization.

World Health Organization. (2015) A practical guide for engaging with mobile operators in mHealth for RMNCH.

World Health Organization. (2019). WHO guideline: recommendations on digital interventions for health system strengthening.

Appendix A: Results Tables and Figures

Table 1: *Population Demographics Pilot Study Cohort*

Pilot Study Cohort								
District	**All**		**Kampala**		**Mukono**		**Wakiso**	
	N = 111 (%)		**(N = 81) (.73)**		**N = 4 (.04)**		**N = 22 (.20)**	
Variable	**N**	**(%)**	**N**	**(%)**	**N**	**(%)**	**N**	**(%)**
Age								
20-25	50	0.46	38	0.47	1	0.25	8	0.37
26-30	40	0.36	31	0.38	3	0.75	5	0.23
31-35	19	0.17	10	0.12	-	-	9	0.41
36-40	2	0.02	2	0.02	-	-	-	-
41-45	-	-	-	-	-	-	-	-
46-50	-	-	-	-	-	-	-	-
Religion								
Catholic	40	0.38	29	0.37	1	0.25	9	0.43
Protestant**	27	0.25	19	0.24	-	-	7	0.33
Born Again***	19	0.18	14	0.18	3	0.75	2	0.10
Muslim	10	0.09	9	0.12	-	-	1	0.05
Anglican	6	0.06	4	0.05	-	-	2	0.10
Christian****	3	0.03	2	0.03	-	-	-	-
Adventist	1	0.01	1	0.01	-	-	-	-
Other*****	-	-		-	-	-	-	-
Highest Level of Education								
No Education	-	-	-	-	-	-	-	-
Primary	3	0.03	2	0.03	-	-	-	-
Secondary	30	0.28	28	0.35	-	-	1	0.05
Higher	76	0.70	50	0.63	4	1.00	21	0.95
Employed	63	0.57	43	0.53	2	0.50	17	0.77
Urban Residence	103	0.94	76	0.94	2	0.50	22	1.00
Literate*	111	1.00	81	1.00	4	1.00	22	1.00
Owns Mobile Phone	111	1.00	81	1.00	4	1.00	22	1.00

Table 2: *Significance Test of Population Demographics*

	Pilot Study (N = 111)		**DHS (N = 2,349)**		**Statistics**	**p-value**	**Test**
	N	**(%)**	**N**	**(%)**			
Age	N =111 M = 26.76 SD = 4.18		N = 2,349 M = 27.07 SD = 8.45		t (154) = -0.71	0.478	t-test
Highest Level of Education							
Primary	3	(0.03)	702	(.31)	χ (5) = 2,370	2.20E-16	Chi-Square test
Secondary	30	(0.27)	1,065	(.47)			
Higher	76	(0.70)	516	(.22)			
District							
Kampala	81	(0.75)	737	(.32)	χ^2 (5) = 3,210	2.20E-16	Chi-Square test
Mukono	4	(0.04)	312	(.13)			
Wakiso	22	(0.21)	1,300	(.55)			
Employed	63	(0.57)	1,511	(.64)	χ^2 (1) = 3.09	7.89E-02	Proportions test
Urban Residence	103	(.94)	1,802	(.77)	χ^2 (1) = 15.8	7.12E-05	Proportions test
Literate	111	(1.00)	1,907	(.81)	χ^2 (1) = 21.1	4.45E-06	Proportions test
Owns Mobile Phone	111	(1.00)	1,895	(.81)	χ^2 (1) = 24.4	7.68E-07	Proportions test

Table 3: *Focus Group Discussion Questions*

Content Area	Question
Health Perceptions*	1. Where are 3 places that you get health information from? 2. What do you think are the 3 biggest problems that can happen to a woman during pregnancy? 3. What are 3 or more of your biggest fears about pregnancy/childbirth?
Nutrition	4. First, I want to know what you think are the best kinds of foods for the baby while pregnant? You can just say them out loud if you would like. 5. When you are pregnant, have there been any types of food in particular that you have been craving? 6. Is there any advice that confuses you regarding what you should and should not eat while pregnant?
Partner Involvement	7. What are some reasons why your partner does or does not come to the clinic with you? 8. Would you want to bring your partner to the clinic with you? Why or why not?
Mobile Phone Use and Text Frequency	9. Do you share your phone with other people? If so, who? 10. How often do you buy airtime? 11. Are there days when you do not have airtime or your phone is not charged? How often does this happen? 12. Do you think receiving a daily, or weekly pregnancy related text would help you during your pregnancy? Why or why not? 13. How many text messages is too few or too many?
Points vs. Money as Incentive	14. Another part of SMS Maama is to give "points" to mothers who respond to text message appointment reminders and questions about their pregnancy to see if they are healthy. Every time the mother answers a text message or brings her partner, she receives 1 point. If the mother earns all 25 possible points, she receives a free "maama kit" on her fourth antenatal visit. 15. Would you be interested in participating in a program that gave you points to earn supplies? 16. How would you feel if you received 1 point for every answered question? 17. How would you feel if you received 1 point for bringing your partner or husband to the clinic? 18. How would you feel if you received about 960 UGX for every answered question? 19. What would you use the money towards?
Presenting to Care	20. How would you feel if a midwife called you if you responded "yes" to a question that asked if you were experiencing a pregnancy problem? 21. How would you feel about calling the clinic yourself to get help? 22. What is something that makes it hard for you to visit the doctor, even when you want to?

Table 4: *Perception of Risks Compared to Biggest Fears (Frequency of Mentions)*

Risk Group	Risk	Fear Group	Fear
1. Death	Miscarriage/Stillbirth (21)	1. Death	Death (12)
	Death (7)		Miscarriage/Stillbirth (11)
2. Complications	Bleeding (11)	2. Vulnerability	Labor pain (12)
	Pre-eclampsia or High Blood Pressure (7)		Mistreated by midwife (3)
	Premature delivery (2)		Lack of finances (2)
	Heavy labor (2)		Naked body (1)
	Caesarean section (1)		Discomfort (1)
3. Illness	Infection (4)		Stress (1)
	Heavy labor (2)	3. Complications	Cesarean Section (10)
	Weakness (2)		Bleeding (3)
	Vomiting (2)		Premature labor (1)
	Malaria (2)		Pre-eclampsia (1)
	Constipation (1)	4. Body Changes	Weight fluctuations (3)
	Swelling of feet (1)		Weight gain (1)
	Sexually Transmitted Diseases (1)		Weight loss (1)
4. Vulnerability	Poor quality of care (4)		Loss of energy (1)
	Lack of antenatal care (2)		Loss of weight (1)
	Lack of resources (2)		Healing afterwards (1)
	Lack of support (1)	5. Illness	Vomiting (4)
	Housing a child (1)		Unhealthy baby (1)
	Depression (1)		STI's (1)
	Exhaustion (1)		HIV Test (1)
	Accidents (1)	6. Nutrition	Drinking a lot of water (1)
5. Body Changes	Weight loss (2)		Foods (1)
	Weight gain (1)		Loss of appetite (1)
6. Nutrition	Loss of appetite (3)		Change in eating (1)

Table 5: *Best Diet for Fetal Development (Frequency of Mentions)*

Food Group	Food
1. Proteins (7)	Fish (5)
	Meat (2)
	Chicken (1)
	Eggs (1)
2. Fruits (8)	Avocado (2)
	Pumpkins (2)
	Mangoes (1)
3. Carbohydrates (4)	Posho (3)
	Matoke (1)
	Porridge (1)
	Rice (1)
	Sweet Potatoes (1)
4. Vegetables	Greens (8)
5. Guidelines	Balanced Diet (3)
	Energy Giving Foods (3)
	Body-Building Foods (1)
	Heavy Breakfast and Lunch (1)
6. Nutrients	Iron (3)
	Calcium (2)
	Vitamins (2)
7. Beverages	Milk (3)
	Water (2)
	Juice (1)
8. Legumes	Beans (1)

Table 6: *Pregnancy Cravings (Frequency of Mentions)*

Food Group	Craving
1. Starches	Matoke (4)
	Posho (2)
	Rice (2)
	Potatoes (2)
	Cassava (1)
	Millet porridge (1)
2. Fruit (2)	Watermelon (2)
	Tomatoes (1)
	Avocado (1)
	Bananas (1)
	Jackfruit/Fene (1)
	Pumpkins (1)
3. Meat (3)	Fish (3)
	Liver (2)
	Chicken (1)
4. Vegetables and Greens (5)	Egobe (1)
	Nakati (1)
5. Legumes	Beans (5)
	G-Nuts (1)
6. Pica	Ash/Clay/Mumbwa/Black Soil (3)
7. Junk Food (2)	Chips (1)
	Pizza (1)
8. Dairy (1)	Yogurt (1)

Table 7: *Sources of Pregnancy Information (Frequency of Mentions)*

Source Group	Source Sub-Group	Source
1. Medical places	Hospital (14)	Benedict Medical Center (7)
		Naguru Hospital (4)
		Mulago Hospital (2)
		Perth Hospital (1)
		St. Francis Nsambya Hospital (1)
	Clinics (12)	Marie Stopes International (1)
	Other	Antenatal care visits (4)
		Courses (1)
		Pharmacy (1)
2. Internet (8)	Social media (3)	Facebook (2)
		Twitter (1)
	Other	Google (7)
		Pregnancy Applications (1)
		Zaala Care (1)
3. People	Family (3)	Elders (2)
		Mother (2)
		Parents (1)
	Non-Family	Other mothers (5)
		Friends (4)
		Adults (1)
	Medical Professionals (2)	Doctors (2)
		Nurses (1)
4. Non-medical places	Community (1)	Work (2)
		Public places (1)
	Other	TV (3)
		Radio (1)

Table 8: *Delays to Attending ANC (Frequency of Mentions)*

Delay	Reason
First	Finances (6)
	Work/Busy (5)
	Exhaustion/"Laziness" (3)
	Husband Won't Come (1)
Second	Distance (3)
	Transport (1)
	Weather (1)
Third	Fear of mistreatment by medical professionals (14)
	Fear of Drugs, Procedures, or Operations (2)
	Drug Shortages (1)
	Long Wait Times (1)

Table 9: *Reasons for Partner Attending/Not Attending ANC (Frequency of Mentions)*

Individual	Attendance	Reason
Partner's Reasons	Partner does not attend	Partner works (9)
		Partner is far (7)
		Partner gender roles (6)
		Partner is busy (6)
		Partner fears tests (4)
		They feel uncomfortable (2)
		Fear of death (2)
		Partner makes excuses (2)
	Partner attends	When there is problem (3)
		Wants to know (2)
Woman's Reasons	Woman wants partner to attend	Partner gives emotional support (5)
		Partner's presence gives woman power (5)
		It's best (4)
		Partnership (2)
		Society treats pregnant women poorly (2)
		Partner makes it easier (1)
		Partner should learn (1)
	Woman does not want partner to attend	Too difficult (3)
		Freedom (1)
		There is no reason (1)