

# Accessing Pre-natal Services: Supporting Women in Rural Kenya

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## ABSTRACT

**Purpose** – This research seeks to understand the service system of women living in the rural town of Laare, Kenya, the factors that impact their access to pre- and post-natal care, and the use of technology by both skilled and unskilled birth attendants [Ericsson, 2008; Mibuari, 2006].

**Methodology/approach** – We randomly surveyed four groups and asked them about their pre- and post-natal experiences and their access to and use of technology (computer, the Internet, or cell phone).

**Findings** – The service system consists of entities that are not directly involved in providing pre- and post-natal services and yet whose interactions with Laarean women influence their perceptions of pre- and post-natal care. Illiteracy and lack of electricity motivate widespread use of cell phones as communal objects. Hence, most respondents owned pre-paid cell phones as shared household items among family members.

**Research implications** – A new framework for service design is needed to leverage cell phones for the delivery of pre- and post-natal services in this community.

**Practical implications** – Leveraging cell phones for the delivery of pre- and post-natal services provides a scalable, adaptable approach that can be applied to other developing economies.

**Originality/value** – There is a paucity of research that focuses on maternal health for rural Kenyan women and the use of mobile technology to deliver pre- and post-natal services to women in this community. Our research represents the initial steps in developing an appropriate service design framework that utilizes technology to promote access to healthcare services for people living in rural developing areas.

**Key words** pre-natal, post-natal, rural, developing economies

**Paper type** – Research paper

## 1. Introduction

One of the most critical interventions for safe motherhood is to ensure skilled care is provided by skilled professionals during pregnancy and childbirth (WHO, 2010). Across Kenya, 75% of all maternal deaths occurred during delivery and the immediate post-partum period, with 58.7% of all births taking place at home. Rural Kenya has 81% of all births occurring across the country. Yet, only 34.5% of those births

had a skilled birth attendant (SBA) present at delivery, as opposed to 72% of births in urban Kenya (representing only 19% of all births across the country) (ORC Macro, 2007). Given that the average Kenyan woman will have approximately 4 children by the end of her reproductive age (most likely in absence of a skilled birth attendant) as well as the high percentage of maternal deaths occurring during delivery and shortly after, ensuring that mothers in this community are healthy during pregnancy, delivery, and immediately after delivery is an extremely important healthcare issue that warrants research.

### **1.1 Demographic Information: Laare, Kenya**

Our research focuses on Laare, a small rural market town that lies on the cusp of central and eastern Kenya. Laare has only one medical doctor for its population of 65,000, one government health center, and two dispensaries, or small clinics. The closest major hospital (i.e., one that has such services as x-ray, MRI, etc.) is Meru, which is over 200 miles away. This distance would take 6 hours to travel by bus, which for this community is cost-prohibitive. The two dispensaries are manned by healthcare professionals that possess the skill set to treat minor injuries. However, the dispensaries do not contain basic medical devices (e.g. blood pressure cuffs) and therefore, are unable to diagnose diseases that are prevalent in people of African descent (e.g., diabetes, hypertension, etc.) or those which may occur during pregnancy as well as during or shortly after labor and delivery (e.g., pre-eclampsia, toxemia, post-partum hypertension). In fact, a needs-assessment survey of members of the larger Laare community identified medical practices and public health resources, including pre- and post- natal care, as the third most important healthcare issue that needed to be addressed (Mibuari, 2008). We describe in more detail the service map of available healthcare services in section 2.

### **1.2 Mobile Phone Use across Kenya**

The use of mobile phones (aka cell phones) has increased enormously over the last 10 years, with over 6 million people owning a cell phone and subscribing to cell phone service in 2006, compared to only 2.7 million people who use the Internet (Eriksson, 2008). One in three adults in Kenya owns a cell phone (Mwakugu, 2007), and Kenyans use cell phones for all kinds of social, economic, and communicative tasks such as making calls, sending and receiving money, job hunting, and to a lesser extent, surfing the Internet (Eriksson, 2008; Fahamu, 2007; Clark, 2007; Nzwilli, 2010). Several factors have made Internet access through traditional broadband or wired means difficult, and these same factors have decreased the demand for landlines for people living in rural areas in Kenya. First, landlines are expensive to install. Second, the physical roads are poorly developed, which has led to both a poorly developed communication infrastructure as well as a lack of widespread electricity. Third, maintenance of landlines is often poor and other environmental factors such as floods and the stealing of copper cables over which communications travel, resulting in landlines that frequently do not function properly.

The majority of communication happens via Short Message Service, or SMS, a communication service component of the Global System for Mobile Communications (GSM) mobile communication system, using standardized communications protocols that allow the exchange of short text messages between mobile phone devices (Eriksson, 2008; Mibuari, Interview Notes, 2009). GSM is the most popular

standard for mobile telephone systems in the world. SMS is cost-effective and efficient as a form of communication, allowing users to receive and reply to short messages at any time. For example, before the advent of cell phones, sending money to one's friends and family required waiting until someone was traveling up-country by bus to be able to pass the money to their family and friends living there (Eriksson, 2008; Mibuari, Interview Notes, 2009). However, with the creation of cell phone functions or "apps", like M-Pesa (M stands for mobile, and Pesa means "money" in Swahili), users are able to go into a local Safaricom shop, a major cell phone company in Kenya, load money on the cell phone account which is then converted into "mobile money", and transfer it to the recipient via SMS. The recipient need only go to a Safaricom shop, show the code and identification, and collect the money (Mason, 2007).

### **1.3 Leveraging Cell Phones for Maternal Health**

Cell phones are being used in many parts of Africa in an effort to decrease the number of maternal and infant deaths. IRIN (2009) has reported a drop in the number of women dying during childbirth in a village in South-central Ghana. Prior to 2008, approximately 20 women died in childbirth each year, bleeding to death while trying to get word to an ambulance service to take them to the hospital. In 2008, after phone and Internet technology were introduced to this small village in Ghana, no women died in childbirth (2009).

In this instance, Ericsson teamed with Zain, a mobile telecommunications firm, to install Internet access and mobile phone coverage in the village in 2006, providing free handsets to health workers and selling handsets to villagers for US\$10 each. While this approach was effective in this small South-central Ghanaian village, the ability to scale such an effort to all rural towns and villages in Africa is unknown, as attempts to lay broadband across the entire continent has been a slow and expensive effort happening over the last 10 years (2009).

### **1.4 Goals and Purpose of Our Research**

While there is a wealth of research that focuses on maternal health for women living in urban areas in developing economies like Kenya (e.g., Silimperi, 2009; Ziraba, et. Al, 2009; Stanback, et.al, 2007), there is far less work that focuses on maternal health for Kenyan women living in rural areas, especially work that focuses on leveraging cell phones to deliver pre- and post-natal information and services for rural Kenyan women. As such, the long-term goals of this research are to:

- decrease the number of maternal deaths that occur during delivery and the immediate post-partum period; and
- increase access to information and healthcare services for rural Kenyan women and their children.

The first steps toward achieving these larger goals involve further understanding the factors that prompted the Laare community to identify pre- and post-natal care as the third most important healthcare issue for their community and to assess the capability of cell phones to begin to address these needs. In particular, the objectives of this first phase of research include:

- Identifying the ecosystem of pre- and post-natal information and services available in this community and factors that impact the type(s) of information and services that women know about, have access to, and/or use through the development of a service map;
- Verifying the most pressing pre- and post-natal issues that women in this community face;
- Understanding the way(s) women in this community use cell phones in their everyday lives;
- Exploring opportunities to leverage cell phones to promote access to information and services for pre- and post-natal care for both skilled and unskilled birth attendants as well as mothers who are pregnant or have small children; and
- Using our understanding of the ecosystem and the way(s) this community uses cell phones to design interventions for the cell phone that can increase access to pre- and post-natal information and services for Laare women

This paper presents preliminary findings which examine pre- and post-natal services available to women in rural Laare, Kenya as well cell phone appropriation by consumers as initial steps in service design for access to pre- and post-natal services. Finally, using the service map as a tool for service design, we discuss how readily available mobile technology can be leveraged to promote access to pre- and post-natal care services as implications for future research efforts.

## 2. Initial Representation of Ecosystem

Based on preliminary research described in Mibuari & HST-MIT (2008) as well as from interview data (Thomas Interview Notes, 2009), some of which has been described in the introduction, we were able to develop an initial representation of the ecosystem of pre- and post-natal services for Laare, Kenya. See figure 1 below.

Service Map of Health Care Ecosystem in Laare, Kenya

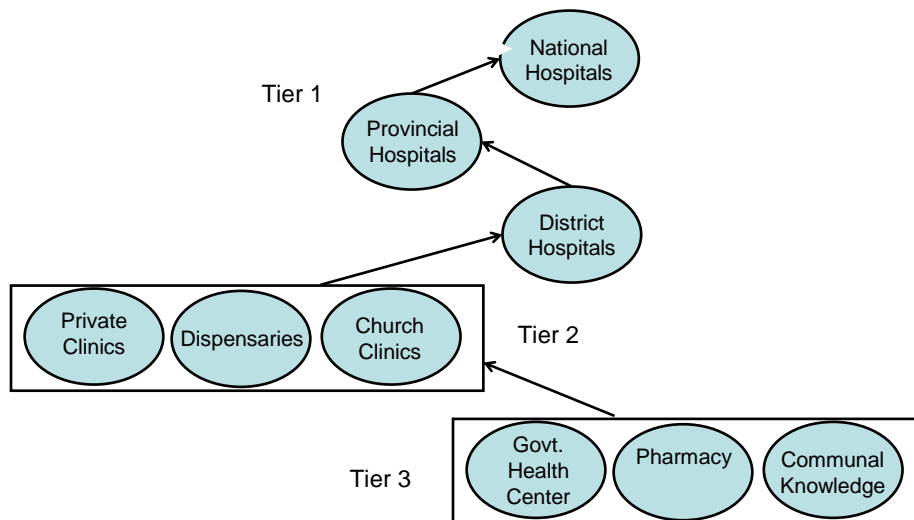


Figure 1. Service Map of the healthcare ecosystem of Laare, Kenya

### **2.1 Tier 1: Limited Access to Urban Healthcare Professionals**

Tier 1 consists of 2 *national hospitals* in Nairobi, the capital of Kenya, which are approximately 500 – 1000 miles away. Patients who do not live in Nairobi travel to national hospitals for expert care or serious illnesses. However, visiting the national hospital requires money and planning to go to the national hospital to be seen by a doctor. Clinics may not have all the resources needed during the first doctor office visit. *Provincial hospitals* are approximately 100 miles away offer similar healthcare services to urban Kenyan populations, and to a limited degree, rural Kenyan populations. *District hospitals* are approximately 50 km away; Meru is the closest district hospital to Laare. Doctors or skilled specialists will periodically visit district or local health centers.

### **2.2 Tier 2: Independently Owned Healthcare Services in Laare**

*Private clinics* are independently owned businesses and consist of two rooms in a building, one room for seeing patients and the second room as a small lab for running tests. These private clinics can accommodate limited out-patient surgery, administer treatment for wounds and collect bodily fluid samples as needed. No x-ray machines are available, so consequently, no x-rays can be taken of patients' bodies. Oftentimes, a doctor attains a license to run the private clinic based upon his/her qualifications even though there may be deficiencies in the medical staff hired. Private clinic staff typically includes nurses who have 2 years of training and often do more than what they are trained to do. For example, if a patient comes in with a machete cut and needs anesthesia for treatment, then the nurse will perform the surgery, though she has no specific training in surgical methods. *Church-run clinics are under the administration of* the Catholic Church and have skilled specialists and doctors that service local health centers too. The private and church clinics have the facilities to treat wounds.

### **2.3 Tier 3: Government Subsidized Healthcare Services and Communal Practices & Influences**

The Kenyan Government provides medicines for subsidized rate to all its government centers and pharmacies; there are medicines distributed by the Ministry of Health which is available at the reduced price at the national, provincial and district hospitals. Medication is distributed by the Ministry of Health and is available at a reduced price at the national, provincial and district hospitals and at the local pharmacy in Laare.

In terms of after-hours health care, Laareans call the local healthcare professional's home. If no answer, then it is common practice to borrow your friend's car and drive to the health care provider's home for assistance. Because there is only one local doctor, the doctor probably knows you personally or via a friend of a friend and is not surprised by after hour visits to her home. Because the Laarean community holds trust for its religious leaders, they serve as a mouthpiece for dispensing medical info. Additionally, the primary school teacher represents another influential people who can sway opinion of locals,

influencing their decisions to partake of available health care services. Thus, it becomes crucial to engage the support of local religious leaders and teachers as advocates of newly available health care services if they are to truly impact the community.

### **3 Method**

We wanted to understand not only what kinds of pre- and post-natal services are currently available to women in rural Laare, Kenya, but also how women in this community learn about and access these services. We also wanted to understand the use of cell phones by both service providers as well as women in this community who use pre- and post-natal services. Given that we could not initially travel to Kenya to observe and interview this community, we decided that we would administer a survey to gather initial insights to inform and shape our understanding of the pre- and post-natal services ecosystem.

#### **3.1 Setting**

We focused our analysis on four areas of town: the Laare Market, Tuuru, the Ntobuine Church, and Kiraro and Ntobuine Village. The Laare market is the area's 'town center' where people mostly go for shopping and government services. Tuuru is a church-run hospital which runs basic outpatient care and has a maternity wing. Ntobuine church is a Catholic church and in the community. Kiraro and Ntobuine are villages in the Laare area.

#### **3.2 Participants/Respondents**

To understand the different types of pre- and post-natal services provided to women in this community, we surveyed healthcare providers who had some degree of formal education or training in pre- and post-natal care (i.e., college, technical school, nursing school). We refer to this group as skilled birth attendants (SBAs). Given that most births that occur in rural areas in Kenya occur without a skilled birth attendant present, we also surveyed those attendants who had no formal education or training in pre- and post-natal care and yet provide pre- and post-natal care; we refer to this group as unskilled birth attendants (uSBAs). Additionally, we surveyed both women who were currently pregnant (CPs) as well as those who had given birth within the last three years (BL3Ys).

#### **3.3 Surveys**

We created three different surveys: one for SBAs, one for uSBAs, and one survey for the population of BL3Ys and CPs. Each survey consisted of two parts: one part that measured access to and use of pre- and post-natal services; and the second part that measured access to and use of technology.

For the SBAs, we asked them about the institutions that had provided formal training, the type and duration of training they had received, and the types of pre- and post-natal services they provide. We also asked them to identify available resources for finding information about pre- and post-natal care and any difficulties with acquiring access to such resources, as well as any difficulties providing services to women in the community. Finally, we asked SBAs about which pre- and post-natal services they

would like to be able to provide the Laarean women. Likewise, for the uSBAs, we asked them about which resources they used for pre- and post-natal care and any difficulties with acquiring access those resources, and any difficulties with providing pre- and post-natal care. We also asked uSBAs about which pre- and post-natal services they would like to acquire knowledge of and which pre- and post-natal services Laarean women need.

We asked BL3Ys and CPs about their use of pre- and post-natal services. In particular, we focused on asking them which services they used and how often, their use of pre-natal vitamins, and their difficulties acquiring access to pre- and post-natal services. In addition, we asked them about resources they utilize when they have questions about pregnancy, labor and delivery, and newborn and infant care. We also asked them about which services or information they would like to know more about.

For all surveys, we asked respondents about their access to and use of technology, especially computers, Internet, and mobile phones. Finally, we asked respondents about their purposes for using mobile technology, how they maintain their mobile phones (e.g., charging, additional minutes, etc.), and whether the mobile phone is a personal device or one used by the entire family.

## **4 Findings**

We have survey results regarding pre-natal experiences for 22 participants and results regarding use of technology for 20 participants. We wanted to understand their experiences with pre-natal services (either as providers or consumers) and we also wanted to understand their use of technology, particularly computers, Internet, mobile phones. Table 1 shows a breakdown of respondents by role and region. The largest number of responses came from consumers of pre- and post-natal services, either women who are currently pregnant (CPs) or women who have been pregnant within the last three years (BL3Ys).

### **4.1 Pre-and Post-Natal Experiences of Currently Pregnant or Recently Pregnant Women**

Among this group of women, the average number of children per woman was 3.86, which coincides with other data [4], with the least amount of children being none (i.e., a woman's first pregnancy) and the largest number of children being 10. Among pre-natal and post-natal services used, 14 of these 16 women stated that they currently or previously attended check-ups either monthly or more frequently. However, only 4 of these women stated that they take pre-natal vitamins. All currently pregnant women (CPs) stated that they plan to use a skilled birth attendant (SBA) to assist with delivery, while 6 of the 8 recently pregnant women (BL3Ys) stated that they had used an SBA to assist with delivery. However, it was not clear whether those women used a midwife to assist with their birth and whether or not the midwife had formal training in pre-natal care, labor and delivery, and post-natal care.

Role	Laare Market	Tuuru	Kairo & Ntobuine Village	Ntobuine Church	Total/(Role)
SBA	0	3	0	0	3
uSBA	0	0	2	1	3
CP	2	0	4	2	8
BL3Y	2	4	0	2	8
Total (region)	4	7	6	5	N/A

Table 1. Number of respondents by role and region

While both CPs and BL3Ys did attend check-ups, 13 women did not utilize hospitals, clinics, or SBAs as resources to find information about pre- and post-natal services. Instead, they stated that they talked to family, friends, co-workers, other women who had been pregnant, and older women, attended seminars, and listened to the news or read newspapers to find out about pre- and post-natal services. These same women cited the lack of money and the lack of knowledge as the most prevalent difficulties to acquiring access to pre- and post-natal services. Additional difficulties in precluding access to pre- and post-natal care included insufficient information, travel distance to better health care facilities, lack of skilled personnel, superstition and illiteracy. When asked about additional services they would like to have, respondents mentioned information about available drugs, maternal nutrition and diseases, information about what to do if there are pregnancy complications, new advanced technologies to ensure that the mother and child are healthy, birth care, and vitamins.

#### 4.2 Pre-and post-natal experience of Skilled and Unskilled Birth Attendants

3 of our respondents were skilled birth attendants (SBAs) and 3 were unskilled birth attendants (uSBAs). These 6 pre- and post-natal service providers represented a combined total of 60 years of experience with 2 years being the least number of years of experience and 23 being the greatest. These service providers have delivered over 265 babies. Respondents listed regular pregnancy checkups, nutritional advice, vaccination, and hygiene among the pre- and post-natal services they provide. Among SBAs, books were listed by all three as a resource used to find information about pre- and post-natal care. Additional resources mentioned by SBAs and uSBAs included medical journals, the internet, information presented at seminars offered by trained personnel, and older women in the community who shared their knowledge and experiences. Lack of current medical books and journals, lack of funds, and lack of knowledge were among the difficulties SBAs and uSBAs faced when attempting to access information about pre- and post-natal care. Illiteracy was cited as the most common difficulty that precluded providing pre- and post-natal care to Laarean women. Other difficulties included detecting



complications at an early stage, lack of equipment, lack of cooperation by mothers, poverty, unavailability of resources to enhance the diet of the mother, and young girls who are pregnant but do not know anything at all about pregnancy, childbirth, pre-natal services, or caring for a child. SBAs and uSBAs indicated that they would like to offer additional services such as education on what to do in case of complications, advice on child hygiene, breastfeeding, nutrition, and taking care of newborn babies to mothers.

### **4.3 Technology Use of Pre- and Post-Natal Providers and Women**

While only 4 of the 20 respondents indicated that they had access to computers, only 3 had access to the Internet. Furthermore, only one respondent had used a computer to enter patient information. In contrast, 17 of the 20 respondents, more than 80%, had access to cell phones. Most people used their cell phones daily to make calls and send text messages. Eleven respondents stated that their cell phones were owned and used by everyone in their household, with all but one respondent subscribing to a pre-paid plan.

## **5 Discussion**

Our analysis of survey results revealed several insights, but also raised additional questions around accessing pre- and post-natal information, providing pre- and post-natal care, the use of technology, and the importance of leveraging cell phones to promote greater access to pre- and post-natal care.

### **5.1 Accessing Pre- and Post-Natal Information**

While most women stated they used pre- and post natal services (i.e., monthly checkups), the SBAs providing these services were not the sources these women turned to for information about pregnancy, labor and delivery, and taking care of a child. Instead they turned to family, friends, co-workers, women who had been pregnant before, and older women in the community. This suggests that additional entities exist within the pre- and post-natal care ecosystem that lack technical training, but have a great deal of societal capital. We call these additional entities atypical providers [5], as they provide information and in some instances, services, but not for monetary gain. Besides providing information about pre- and post-natal services, the underlying question remains as to what other roles do these atypical providers play? The answer to this question requires further research involving in-depth interviews and focus group discussions.

Survey results revealed that there were women who did not use pre- and post-natal care. Women felt pre- and post-natal services were too expensive, suggesting that an intervention must be cost-effective as well as provide easy access for utility. One respondent, who has 10 children and plans to have more, stated, "I have given birth to 10 healthy children. Why should I use expensive medicine for no apparent reason?" Her response suggests that she knows how to successfully birth babies that develop into healthy children and that this knowledge would benefit newly pregnant women in the community who do not possess such knowledge. Her response also identifies a potential access point to pre- and post-natal services and an opportunity to design a pre- and post-natal care information service that leverages

communal knowledge and experiences that consequently, would benefit other women in rural areas like Laare.

## **5.2 The Use of Mobile Technology to Provide Access to Pre- and Post-Natal Care**

Given the findings mentioned above, we identify three design implications for designing mobile-based services to provide access to and deliver pre- and post-natal care: 1. mobile technology that removes the barrier of illiteracy; 2. secure individual information on shared mobile devices; and 3. communal influencers as co-designers and advocates of pre- and post-natal interventions.

### **5.2.1 Mobile devices that Eliminate the Barrier of Illiteracy**

Illiteracy was cited by SBAs and uSBAs as the major difficulty in providing pre- and post-natal care for women in this community. Therefore, interventions promoting access to pre- and post-natal care must be delivered in some form other than text (e.g., voice, visual, etc.). Remembering that the overwhelming majority of respondents had access to a household cell phone, we posit that mobile technology is the ideal platform for providing access to pre- and post-natal supplementary care. The issue is how do we design user-friendly interfaces for mobile technology that removes the illiteracy barrier. Since most respondents indicated that they send text messages, to what extent can we convey meaningful pre- and post-natal care information in SMS format that can be easily consumed by women? These are just a few of the questions that need to be considered in the development of mobile-based health care services.

### **5.2.2 Security and Privacy Issues for Shared Mobile Devices**

The use of the cell phone as a communal device as opposed to a personal one raises questions about patient privacy, as pregnancy is subject to the same limitations of privacy as other medical issues. How do we keep sensitive individual info secure and private on shared mobile devices? For instance, if a pregnant woman's fetus is diagnosed with down syndrome, how could that information be shared with her via her cell phone without her husband getting access to her personal record, given that the cell phone is owned and used by them both? Service providers need to devise technical solutions that ensure individual privacy for shared mobile devices. Currently, no such privacy or security algorithms exist since the assumption in developing and offering mobile-based health care services is that each mobile device is a privately owned device. One possible solution would be the use of biometrics (fingerprint) to identify the individual user; this information would be the reference key for accessing individual health care records, test results, and any other useful information.

### **5.2.2 Communal influences as co-designers of health care services**

Understanding the communal influences of religious leaders and primary teachers, we acknowledge the need to engage these communal influences as co-designers and advocates of pre- and post-natal services. In addition to the SBAs and uSBAS, the religious leaders and teachers represent atypical service providers in that they wield their influence to determine which pre- and post-natal care services will be utilized and adopted by the community. The implications for service design argue for a

participatory approach in which the communal influencers have a voice in the design of the technology and its use since they have the ear of the people. This does not imply that health care professionals or technology designers should ignore their respective expertise. Rather, the goal is to work together to uncover alternative solutions that will better service the pre- and post-natal needs of Laarean women. For example, the primary teacher could be an advocate by offering workshops that explain how to use mobile applications that feature pre- and post-natal advice and how local women can utilize such technology to share their experiences with one another. This is just one example of non-traditional approach to service design and the justification for utilizing such an approach for developing economies such as rural areas.

## **6 Future work**

This paper presents on-going work to understand both the availability of pre- and post-natal services to women in the rural town of Laare, Kenya as well as the affordances of technologies, particularly cell phones, to promote greater access to pre- and post-natal care for these women. For future work, we will conduct a second visit to Laare, Kenya in August to observe and interview skilled and unskilled birth attendants, currently pregnant women, and recently pregnant women within the last 3 years to understand in depth the ecosystem of typical and atypical healthcare providers. The results will iterate the design of the service map the Laarean health care ecosystem (e.g., a service map). We also want to observe up close their use of cell phones and identify any other technologies that are widely used in this community. Furthermore, we want to gain more insight into how members of this community charge their cell phones, given a shortage of electricity, as well as how they use pre-paid cell phones within their households. The goal is to develop an initial prototype of a mobile application based on these survey results and get feedback from members of the Laare community.

## **7 Acknowledgements**

We thank the community of Laare, Kenya for participating in our survey, and we thank Eric Mibuari and Matthew Tuta for providing access to the Laare community and for administering the surveys.

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