THE DIGITAL LABOR WARD:

TELECONSULTATION IN RURAL GHANA

by

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List of Abbreviations

ANC – Antenatal care

CHO – Community Health Officer

CHPS – Community-based Health Planning and Services

DHA – District Health Assembly

GHS – Ghana Health Services

ICT – Information and Communication Technology

LARC – Long-Acting Reversible Contraceptive

MDGs – Millennium Development Goals

MoTECH – Mobile Technology for Community Health

MVP – Millennium Villages Project

NHIS – National Health Insurance Scheme

OPD – Out-Patient Department

PHC – Primary Health Care

SBA – Skilled Birth Attendant

SDGs – Sustainable Development Goals

SMI – Safe Motherhood Initiative

SPHC – Selective Primary Health Care

STS – Science and Technology Studies

TBA – Traditional Birth Attendant

TCC – Teleconsultation Center

ToT – Training of Trainers

UNDP – United Nations Development Programme

UNFP – United Nations Population Fund

UNICEF – United Nations Children's Fund

WHO – World Health Organization

The Digital Labor Ward: Teleconsultation in Rural Ghana

Abstract

by

HEATHER ROSE BAILY

The purpose of this dissertation is to provide a holistic understanding of the uptake of telemedicine in Ghana. A year-long, in-depth ethnographic study where telemedicine projects had been occurring for nearly a decade provided an ideal setting to study the theoretical and practical applications of telemedicine. This research examines two systems of telemedicine: the Ghana Health Service's (GHS) national telemedicine program, and a parallel teleconsultation system occurring over WhatsApp.

This dissertation has two overall aims. The first is to determine how telemedicine is being used for obstetric care provision in Ghana. Understanding how, when, and why telemedicine is used to handle obstetric cases can shed light on its usage for other, less common emergency cases. To situate the midwives' work and their interactions with telemedicine within theoretical perspectives, this dissertation draws from the anthropology of reproduction literature, particularly regarding conceptions and definitions of risk. It also draws from postcolonial science and technology studies (STS) literature that examines biomedicine in postcolonial contexts, as well as other STS literature that theorizes how technologies are adopted and adapted. The second aim of this research is to explore the complexities of technological and bureaucratic systems, like telemedicine programs and the GHS, which are both hierarchical and social in nature. This dissertation will discuss the

intricacies that must be considered in order to successfully integrate a technological system such as telemedicine into a large health system.

Ultimately, I argue that telemedicine is being integrated into a complex system with set hierarchies and it reinforces authoritative knowledge and power structures. Telemedicine appears deceivingly simple from the outside: everyone has cell phones, so why not use them for consultation in the health system? However, while implementing a technological solution may at the surface level seem to be disparate from the social system, it is not. In order for a telemedicine intervention to be successful, it must be integrated in such a way that it does not change the normal flow of information, communication, and work that currently exists within the health system.

Chapter One
Introduction

> *I had an incident where, when I started doing the telemedicine project, even before that, a community health nurse called me and said that there is a woman who has delivered three days ago and brought the baby to her. And the baby is so lethargic, crying, in a very remote part of Builsa District [Upper East Region]. The child is crying, almost breathless and she doesn't know what to do for the child. The child was stung by a scorpion. The mother put the child on the ground and the scorpion stung the three-day-old baby. So there is no vehicle to come, what do you do? You give some antihistamines, you give some paracetamol. So over the phone, I tried to tell her what to do. And then a nurse from Sandema had to rush by motorbike to get the antihistamines to the child, to the nurse. So those are the kinds of things that you will see recorded through the TCC [teleconsultation center]. – Quote from an interview with a Ghana Health Service Administrator*

Right now, there is much anticipation in the global health world about the potential of telemedicine because of case examples and success stories like the one in the quote above. *Telemedicine* is technologically-mediated communication between health professionals regarding medical care (Pols, 2012). In places where there are no vehicles, poor roads, and medical emergencies, there are cell phones. During frightening and dangerous medical scenarios in rural settings, forms of telemedicine such as teleconsultation offer the promise of connection to others that can help. And indeed, when I arrived in the Upper East Region of Ghana to study the Ghana Health Service's (GHS) telemedicine program, I expected to find cases and results such as this, particularly for obstetric care[1]. However, I found that just as

[1] Throughout this dissertation, I use the term *obstetric care* to encompass all reproductive care, regardless who is providing it. Though often associated with physicians in particular, the term technically means "medicine that deals with the care of women during pregnancy and childbirth," and therefore I attribute it to all reproductive care equally.

birth does not occur outside of social contexts (Browner, 2001), neither does telemedicine.

Study Aims

This dissertation provides a holistic understanding of telemedicine as a technological system that involves human actors. The research has two overall aims. The first aim is to determine how telemedicine is being used for obstetric care provision in Ghana. This dissertation is an examination of biomedically trained obstetric care providers, who are called midwives in the GHS system, their work, and their interactions with telemedicine. Many of the high-risk or emergency cases that health facilities in rural areas encounter are obstetric-related, and therefore, reproduction and obstetric care provide an excellent vehicle through which to study telemedicine. Understanding how, when, and why telemedicine is used to handle obstetric cases can shed light on its usage for other, less common emergency cases. To situate the midwives' work and their interactions with telemedicine within theoretical perspectives, this dissertation draws from the anthropology of reproduction literature, particularly regarding conceptions and definitions of risk. It also draws from postcolonial science and technology studies (STS) literature that examines biomedicine in postcolonial contexts, as well as other STS literature that theorizes how technologies are adopted and adapted.

The second aim of this research is to explore the complexities of technological and bureaucratic systems, like telemedicine programs and the GHS, which are both hierarchical and social in nature. This dissertation discusses the

intricacies that must be considered in order to successfully integrate a technological system such as telemedicine into a large health system. It provides an overview of the evolution of Primary Health Care through the decades that helps to situate telemedicine programming, and explore future directions for its place in global health. It also details other examples of anthropological studies of health systems to highlight the importance of understanding social aspects of these systems.

This dissertation details how telemedicine is being accepted or rejected by the ideal target users, specifically the nurses "on the periphery" of health systems, such as those working in rural Ghana. The periphery is an apt term to situate these target users of telemedicine in two senses: first, they are literally at the outskirts, often posted in remote locations far from cities and hospitals, or down roads that are time consuming and sometimes treacherous to pass; secondly, they are on the periphery of the medical system, as they have minimal training and limited medical knowledge and skill, and are just barely qualified biomedical providers.

For context, Kuupiel et al. (2019) published a spatial analysis on the geographical accessibility to hospitals in the Upper East Region, the area where this study took place. The authors used ArcGIS to plot the coordinates of primary healthcare facilities in the region and the locations of district hospitals, then created an algorithm to estimate the time it takes to travel from a health facility to the nearest hospital on existing roads. They estimated a speed of 20km/h, as that is the average speed that a motorized tricycle – either the "motorking ambulances" that

are provided by the GHS or tuk tuks known as "Mahama can do's"[2] – would likely travel (Figure 1.1 and Figure 1.2, respectively).

Figure 1.1 (Left): Photo of a motorking ambulance (Source: Twitter).
Figure 1.2 (Right): Photo of Mahama can do's lined up (Source: Geoffrey Buta for Goldstreet Business).

This mode of transportation was selected because it is the most likely form of transport, as larger vehicles like cars and trucks are harder to come by, more expensive to hire, and cannot transverse some of the roads. Motorcycles are the most common form of transportation in this area, but are not ideal for transporting people in need of medical care. The results of Kuupiel et al.'s (2019) spatial analysis demonstrate that there are health facilities in the region that are more than 60 kilometers from the nearest hospital, and it can take three hours or more to transverse that distance. Further, they found that 66% of their sample of 100 facilities in the Upper East Region are located 45 minutes or more from a referral-receiving facility (Kuupiel et al., 2019). These time estimates do not take into

[2] "Mahama can do" also called "can do," "camboo," or "John Mahama's" are all terms referring to tuk-tuks. In 2016, then-President John Mahama attempted to win favor for re-election in the northern regions of Ghana by introducing the import of tuk-tuks from India to be used as a new form of taxi service. The campaign touted this was an indication of what "Mahama can do" for Ghana, and tuk-tuks quickly became known as such, or some derivation of that phrase.

consideration other factors, such as weather and damage to roads or vehicles, that can prolong the journey even more.

The main premise of the GHS telemedicine program is that a nurse stationed at one of these remote health facilities described above can call into a teleconsultation center (TCC) for over-the-phone consultation when they are unsure of how to handle a case. By receiving guidance during the call, the nurse 1) learns something (or "builds capacity") and 2) spares the patient from having to be referred to the next level of care. In essence, it is a formalized version of what happened in the story at the beginning of this chapter. Rural northern Ghana, where telemedicine projects had been occurring for nearly a decade, provided an ideal setting to conduct a year-long, in-depth ethnographic study the theoretical and practical applications of telemedicine.

As demonstrated in the quote at the beginning of this chapter, much of the hype about telemedicine is in regards to its ability to improve maternal, neonatal, and infant health outcomes. This dissertation is particularly focused on telemedicine and obstetric care, though it also examines the GHS telemedicine system broadly and its utilization in the Upper East Region. Midwives, the main actors in this study, are "on the periphery" only in the first sense: they are posted to rural and remote locations, but they have more medical training than a regular nurse or community health officer (CHO) who is also posted to the same facilities. Many of the success stories and larger rhetoric often aimed at donors highlights how telemedicine is saving mothers and babies, just as it did in the case of the scorpion sting. This dissertation project examines that claim in depth.

Literature Review

This section provides an overview of the literature on telemedicine and eHealth, followed by a summary of the anthropology of reproduction literature, with a particular focus on risk in reproduction. It also details some of the science and technology studies (STS) literature, particularly in the postcolonial context, and ends with a historical analysis of primary health care programs.

Telemedicine and eHealth

There has been great interest in introducing various types of electronic health (e-health) programs into global public health for roughly two decades (World Health Organization, 1998; World Health Organization, 2010; Aranda-Jan et al., 2014). E-health is a broad term that encompasses all forms of electronic processes and communication regarding health care, including: mobile health (mHealth) interventions, electronic health records, and telemedicine, among other things (Clifford, 2016; World Health Organization, 2016a). Given the near ubiquity of mobile phones in low- and middle-income countries, these types of interventions are seen as opportunities to potentially reach a large swath of populations that are currently hard to access due to lack of infrastructure (Ruton et al., 2018). Thus far, many small-scale pilot projects have occurred, with the majority of them being mHealth projects focusing on maternal and child health (Tamrat & Kachnowski, 2012; Agarwal & Labrique, 2014; Kruk et al., 2016; Lee et al., 2016; Sondaal et al., 2016; Chen et al., 2018). However, most projects have been limited in scope and there have been few examples of any type of an e-health project being scaled up

(Tomlinson et al., 2013; Chib et al., 2014). The GHS telemedicine program is one of the first to be attempted at a national scale.

Anthropological Studies of eHealth

Some anthropologists, such as Tanja Ahlin and Vincent Duclos, have examined how telemedicine affects power dynamics between patients and providers (Duclos, 2015; Ahlin, 2011). Duclos (2015) argues that e-health programs "distribute knowledge in ways that encode and reinforce existing relations, [and are] enmeshed in a multitude of force relations, mobilities, and strategies aimed at the government of human life" (p. 161). Alternatively, Ahlin (2011) argues that telemedicine democratizes medical knowledge, leveling the playing field to some extent. In an ethnographic study, Ahlin (2018) examined the use of information communication technologies (ICTs) and provision of care for aging parents in India by their adult children abroad. Using a material semiotics approach, she argues that families use programs like Skype to create systems and patterns of calling so that the elderly parents do not feel abandoned or alone, and children can feel like they are taking care of their aging parents while continuing to live and work abroad (Ahlin, 2018).

MacDonald and Diallo (2019) conducted an ethnographic study examining an mHealth project in rural Senegal that aimed to reduce the high maternal mortality ratio. The findings of this study revive old themes in anthropology of reproduction literature, including authoritative knowledge and the role of the traditional birth attendant (both topics discussed in detail in the next section). Essentially, the authors found that giving a phone to a *matrone*, the local obstetric care providers in rural Senegal, boosted both her skills and social status (MacDonald & Diallo, 2019).

In a study of an mHealth program in Tanzania, Hackett and colleagues (2018) found that women often attempted to keep pregnancy and childbirth a secret, and clients felt that record-keeping via cell phones facilitated more privacy than paper records. The mHealth program detailed in the study allowed for community health workers to visit the homes of pregnant women, which allowed them to keep their pregnancies more hidden than if they were to attend antenatal care at a clinic. Hackett et al. (2019) also found that mHealth programs improved relations between clients and community health workers and improved efficiency and data management. However, more regulation and transparency regarding how data are stored, protected, transmitted and used is needed to better protect patient information (Hackett et al., 2018).

Hackett et al.'s (2018) study contrasts with a study by Duclos and colleagues. In their analysis of an mHealth program aimed at improving maternal health in Burkina Faso, Duclos et al. (2017) reported that sharing patient information over phones flagged multiple confidentiality concerns. Burkina Faso is a very poor country and phones are typically shared resources within households. The mHealth program discussed in Duclos et al.'s (2017) study sent health messages to pregnant women as an audio recording. However, a message intended for a pregnant woman may be intercepted by her husband or mother-in-law if they were in possession of the phone when the message came in. This would not only break the confidentiality of health information that was intended for the pregnant woman, but also might disrupt her continuum of care if she did not receive the information about her next appointment

(Duclos et al., 2017). These contrasting results from similar programs highlights the need to understand the range of contexts for use and uptake of mHealth.

Anthropology of Reproduction

Anthropologists have been studying reproduction, including topics such as pregnancy, birth, and the various actors and factors associated with reproduction, for many decades now. This section provides an overview of the relevant work in the field.

The Medicalization of Birth

Some of the earliest works in the anthropology of reproduction were cross-cultural analyses of birth. One of the best-known examples of this is *Birth in Four Cultures* by Brigitte Jordan. Jordan (1993) used a biosocial framework to compare and contrast low-tech births attended by Mayan midwives in the Yucatan, midwife-assisted births in Holland and Sweden, and the technology-centered births attended by physicians in the United States. The typical model of birth 'makes sense' for each particular context. Jordan's biosocial model explores the 'mutual feedback' between biology and culture to understand birth as a cultural system (Jordan, 1997). For instance, in the Yucatan, childbirth is very woman-centered and multiple women are in attendance to support a woman through her birth. While that model is what is expected and makes sense in that part of Mexico, the US model of limiting who can be in the delivery room would not make sense in that context. How a culture decides what the appropriate type of care is for childbirth is dependent on a variety of

factors, including what is deemed the best way to mitigate risks during delivery and post-partum.

A number of scholars have studied the history of pregnancy, midwifery, and childbirth (e.g., Ehrenreich, 1973; Davis-Floyd, 2003; Epstein, 2010). Midwives historically attended births at home in Western Europe and birth was treated as a natural event. Beginning in the 18th century, medicine became a formal profession and only men could be doctors. Not long after, male doctors ventured into the new profession of obstetrics and began attending births (Epstein, 2010). Doctors also started to use tools during delivery, beginning with the forceps, while midwives generally relied on medicinal herbs when necessary, rather than tools. This shifted the perception from birth being a natural event to a medical condition that needed technological intervention. It was argued that without intervention, there was an increased risk of maternal or infant death.

In the late nineteenth and early twentieth centuries, management of childbirth in the colonies became an important concern for colonizers. The reasoning was twofold: first, high infant and maternal mortality, along with depopulation, was of major concern because it indicated a threat to the labor pool (Van Hollen, 2003). The second reason for the interest in managing childbirth was that it was seen as a way to modernize the colonies. 'Native motherhood' was seen as a threat to the goal of modernizing colonies because it meant that the next generation would be 'stagnant in its backwardness' (Allen, 2004). By encouraging biomedical management of childbirth, colonizers were able to undermine local structures of authority held by local midwives, typically old women (Allen, 2004; Thomas, 2003).

In colonial India, traditional midwives were represented as 'ignorant' and 'barbaric' and high rates of infant and maternal mortality were blamed directly on them (Van Hollen, 2003). Hunt (1999) gives a detailed analysis of how colonizers in the Belgian Congo used medicine, including the medicalization of childbirth, to 'civilize' colonized subjects. She explains how the British would discourage women from allowing "dangerous old grann[ies]" to interfere with births, and encouraged them to come instead to the missionary hospitals (Hunt, 1999: 209). Demonization of the midwife and associating midwifery with danger in pregnancy was one step towards the medicalization of birth.

Additionally, drawing from historical documents, Hunt (1999) demonstrates how the focus on medicalizing birth was considered to be a way of promoting domesticity and Christian values. For instance, it was argued that the promotion of maternal hygiene would also promote marital monogamy, clean bodies (and clean lives), as well as spiritual transformation. As most of the healthcare centers were run by Christian missionaries, many of the babies born there were baptized upon delivery (Hunt, 1999). Thomas (2003) argues that Christianity was also a driving factor for colonizers to control reproduction in Kenya, where traditional initiation rites were seen as barbaric, too focused on sex, and caused girls to withdraw from missionary schools. By keeping girls in school, they could continue to 'civilize' them through Western education and by imparting Christian values.

Davis-Floyd (2001) studied *partera profesional,* or 'professional midwives' in Mexico. The first generation of this new category of midwife in Mexico consisted of women who are trained by American biomedical midwives. There was some debate

as to what was the best method for training professional midwives: do they learn through apprenticeship, as traditional midwives do, or do they learn in a vocational school-like setting, which doctors find more acceptable? This case is an excellent example of the age-old question, 'whose knowledge counts?' (Davis-Floyd, 2001). As discussed above, men took over obstetric care because they believed their knowledge and use of tools was superior to natural midwifery. At this time in Mexico, as they were developing a professional midwifery curriculum, there was again tension between the knowledge and systems of learning from the traditional midwives and the doctors, which was not dissimilar from what occurred in many other places around the world.

Authoritative Knowledge

Authoritative knowledge is "the knowledge that within a community is considered legitimate, consequential, official, worthy of discussion and appropriate for justifying particular actions by people engaged in accomplishing the task at hand" (Jordan, 1997: 58). Authoritative knowledge is agreed upon by collective assessment in a local setting and it is displayed in everyday practices (Jordan, 1993; Davis-Floyd & Sargent, 1997; Ivry, 2010). The power of authoritative knowledge comes from the fact that it is consensually constructed (Jordan, 1993; Browner & Press, 1996). There is, nonetheless, an element of hegemony to authoritative knowledge because information coming from a person in a position of power (a physician, for example) is generally taken as fact because the person disseminating that knowledge is considered to be legitimate and trustworthy.

Reproductive authoritative knowledge is not always based in science or biomedicine. For instance, 'unskilled' midwives in the Kaqchikel society in Guatemala have a different understanding of what constitutes an obstetric emergency than biomedical guidelines, and thus traditional midwives are more trusted than hospitals because their knowledge has greater authority (Berry, 2005). The traditional knowledge of Mayan midwives is favored over biomedical obstetric models for many Guatemalan women because they treat childbirth as a natural process, while doctors at biomedical facilities often focus on problems that need to be solved through technological interventions (Dudgeon, 2012).

In Greece and Israel, on the other hand, technology and those who provide it are seen as having authoritative knowledge (Georges, 2008; Ivry, 2010). In Greece, pregnancy screening through ultrasounds is not only routine, but is reassuring for pregnant women (Georges, 2008). In Israel, many women opt to have genetic screening done during their pregnancy because a longstanding governmental program has encouraged women to test for 'inborn abnormalities' (Ivry, 2010). Defining which knowledge is determined to be legitimate, and what makes it legitimate, is a collective, iterative process that varies across settings.

Risk and Reproduction

Risk has been an important conceptual category within anthropology, and has been defined and theorized in several different ways. Douglas (1985, 1992) was one of the first to analyze risk as a concept. Understandings of risk are contingent on social position, 'cultural biases,' or expert knowledge that is always socially and culturally constructed as a local 'risk portfolio' based on collectively shared fears

(Douglas, 1985, 1992; Fordyce & Maraesa, 2012; Desmond, 2015). Biomedical risk is nearly exclusively focused on ill-health and therefore examines risk at the individual level. However, other conceptions of risk sometimes includes the broader consequences, though these are often considered "lay" opinions of risk (Allen, 2004). Expert or biomedical opinions are often portrayed as superior, as they are based in scientific data, while layperson's views are widely seen as misconceptions (Oaks & Harthorn, 2003). A limitation of expert categories of risk is that it is typically dichotomous – either someone is "high-risk" or "low-risk," with no room for nuance (Panter-Brick, 2014).

Nichter (2003) argues that medical anthropologists should be more engaged in discussions of risk and harm reduction. By combining analyses of lay conceptualizations of risk, knowledge production about risk, understanding trust of expert knowledge about risk, and the politics of responsibility associated with risk, anthropologists can contribute to broad international health policy (Nichter, 2003). For instance, in northern Thailand, cervical cancer screenings raised awareness about the disease but also created great fear of gynecological issues that led many women to self-treat and has had a large negative impact on mental health. Many women report experiencing *mot luuk* (uterus pain), and the researchers found women suffer from anxiety, insomnia, and fear of death in the near future because they assume their symptoms mean cervical cancer (Boonmongkon, Nichter and Pylypa, 2001). Raising consciousness about a disease that affects few people caused major upheaval in Thailand. By conducting an ethnographic study of the situation,

Boonmongkon, Nichter, and Pylypa (2001) were able to better understand the effects of labeling someone "at risk."

Reproduction is widely seen as a dangerous time in a woman's life. In most places, childbirth and the time immediately following are considered to be the most dangerous for the mother, the baby, the family, and the community (Jordan, 1993). However, biomedical risks alone do not fully account for the myriad of reproductive risks and experiences globally (Fordyce & Maraesa, 2012). Allen (2004) discusses two types of maternal risk: risks *of* motherhood (biomedically defined risks, such as those outlined in the Safe Motherhood Initiative) and risks *to* motherhood (broader conceptions of potential threats to pregnancy and motherhood). These can be categorized into official and unofficial designations of risks, or more simply put, these two categories can be considered as expert and lay definitions of risk.

Official definitions of reproductive risk are based on biomedical conditions. Within a biomedical framing of risk, pregnancy is considered to be a risky state because it is potentially pathological (Ivry, 2010). Allen (2004) defines official definitions of reproductive risk as "the various factors that have been identified by international and national policymakers as posing risks to women's survival during pregnancy and childbirth" (p. 9). The World Health Organization (WHO) presents a variety of factors that are considered reproductive risk factors, including socioeconomic risk factors, unattended births, previous pregnancies, unwanted pregnancies, and medical risk factors (Allen 2004; World Health Organization 2016a). The leading medical factors contributing to maternal mortality, according to a WHO systematic analysis, are 1. hemorrhage 2. hypertension 3. sepsis 4. abortion and 5.

embolism (Say et al., 2014). Other direct causes (e.g., complications of delivery or obstructed labor) and indirect causes (pre-existing conditions such as HIV) were also factors, but with lesser degrees of severity (Say et al., 2014).

Compared to other reproductive risks, maternal mortality has been discussed less in the anthropological literature. Janes and Chuluundorj (2004) discuss how neoliberal policies in Mongolia drastically reduced funding for healthcare services and increased the vulnerability for maternal mortality. Berry (2010) argues international health policies in Guatemala that marginalize traditional birth attendants actually put mothers at greater risk for dying during childbirth. Maternal mortality is almost always discussed in morbidity and mortality ratios (MMR), which is effective in quickly demonstrating inequalities between countries. However, Storeng & Béhague (2014) call this 'evidence-based politics' that while greatly influencing policy priorities and funding allocations, does little to answer *why* these rates are what they are. It is also important to recognize that biomedically defined risks are not the only types of risks a woman faces. According to the WHO (2016b) fact sheet on maternal mortality, "Other factors that prevent women from receiving or seeking care during pregnancy and childbirth are: poverty, distance, lack of information, inadequate services, and cultural practices." Ethnographic research can provide additional evidence regarding the broad range of factors that influence maternal mortality to better understand why these rates are what they are.

Allen (2004) defines unofficial risk as "those risks that, although valid for community members at a local level, did not become part of any official policy" (p. 9). She argues that risks incorporated in the 'official' category are incomplete and

are not representative of every woman's concerns regarding pregnancy and childbirth. Unofficial risks are just as important to consider as official risks because they greatly influence experiences and management of pregnancy, as well as decision-making about what type of care to seek.

Chapman (2003) details several different types of unofficial risks, which she calls personalistic threats, for pregnant women in Mozambique. A personalistic threat is an illness caused by either a powerful human wishing to do harm (such as a witch or sorcerer) or by a malicious non-human entity (such as a ghost or evil spirit). Personalistic threats are believed to cause issues such as difficulty conceiving, reproductive loss of any kind, and complications during delivery, among other things (Chapman, 2003). Fear of personalistic threats strongly influences patterns of resort for these women, many of whom delay seeking antenatal care until late in their pregnancies (average gestation was six months at time of first seeking care for her sample) because they want to keep their pregnancy a secret for as long as possible (Chapman, 2010). This is because jealousy is believed to be a leading driver in someone committing personalistic threats against a pregnant woman.

There are quite a few ethnographic examples from Tanzania of unofficial risks (Allen, 2004; Spangler, 2011; Young, 2012; Kamat, 2013). Pregnant women and infants are considered to be more susceptible to witchcraft because of their vulnerable nature (Young, 2012). Allen (2004) describes reproductive threats throughout the reproductive continuum. There are many taboos for women during pregnancy, such as they cannot cross a river and cannot apply mud plaster to walls and floor. Additionally, there are a number of threats that are believed to cause

miscarriage, such as sorcery brought on by a jealous person or displeased ancestors. Other threats to maternal health include the need to receive a hot sponge bath after delivering, because failing to be bathed puts a mother is at risk for many things, including death (Allen, 2004). For young children, a common threat is *degedege* (Kamat, 2013; Spangler, 2014). *Degedege* is a traditional illness believed to be brought on when an evil bird flies over a child at night. Kamat (2013) explains that the symptoms of *degedege* are consistent with symptoms of cerebral malaria, but people believe them to be separate illnesses.

The Safe Motherhood Initiative (SMI) was created in 1987 by an interagency group of United Nations (UN) actors, including the United Nation's Children Fund (UNICEF), United Nations Population Fund (UNFP), the WHO, and the World Bank (Storeng & Béhague, 2014). It was enacted in response to attention drawn to the fact that most of the work in maternal and child health was too focused on child health and not enough on maternal health (Rosenfield & Maine, 1985). Proponents of the SMI argued that maternal deaths are unlike other deaths because "pregnancy is not a disease but a normal physiological process that women must engage in for the sake of humanity" (AbouZahr, 2003:18). Therefore, proponents argue that safe motherhood must be viewed as a human right. The goal of the initiative was to reduce maternal mortality by half by the year 2000. This agenda had fourteen sub-goals intended to help reduce maternal mortality, including educating women, improving family planning services, advancing access to primary healthcare, and improving women's social status (Berry, 2010).

In international health, there are several terms commonly applied to a diverse set of women who assist during birth: traditional birth attendants (TBAs), skilled birth attendants (SBAs), and midwives. The term TBA incorporates a very large, heterogeneous population (Justice, 1999; Hildebrand, 2012; Davis-Floyd, 2003). This categorization and the language used have practical consequences (Pigg, 1997). The terminology of "traditional" has overtones of being backwards and subpar to the "skilled" attendants. "Skilled" birth attendants are only those who have been professionally trained in biomedical obstetrics. To further complicate matters, the term "midwife" is used for both TBAs and SBAs. As discussed earlier, historically, midwives were not biomedically trained, but learned how to attend births through apprenticeships with other midwives. Therefore, the term midwife is sometimes used to mean a TBA, but it also is applied to SBAs. In the British medical system, a midwife is someone who went through biomedical training. Former British colonies, including Ghana, follow suit and use this term to mean SBAs who attended formal biomedical training to provide obstetric care. To avoid confusion with the term midwife, maternal health policies tend to only use TBA and SBA terms, but in this dissertation I use the term midwife because that is the designated term for the role and rank of the biomedical obstetric care providers in Ghana.

Thus far, the anthropology of reproduction literature has almost exclusively focused on TBAs, and there are very few examples of ethnographic studies with SBAs. Exceptions to this include Barkin & Hildebrand (2014), Hildebrand (2017), and Strong (2017, 2018). Vanessa Hildebrand is one of the few anthropologists who studies skilled birth attendants through her work in Indonesia. Her article with

Gareth Barkin (Barkin & Hildebrand, 2014) describes a JHPIEGO[3] program intended to educate midwives via a radio program. They describe the entangled trajectories of global health programming, broadcast media, and the former President Suharto's authoritarian New Order regime in the implementation of reproductive health programs in Indonesia. They argue that the ultimate failure of the program, as well as its negative assessment by the midwives they interviewed, was in part due to its most celebrated feature: the use of the radio, and the appropriation of the accompanying discourse traditionally associated with authoritarian command. They focus on the role of the radio as a historically contextualized medium, and how this element of program design led to associations and outcomes that program administrators did not anticipate (Barkin & Hildebrand, 2014). Additionally, Hildebrand (2017) draws attention to the fact that skilled birth attendants are an understudied group, and calls for more anthropologists to address this dearth in the literature.

Adrienne Strong (2017; 2018) has risen to Hildebrand's challenge, and conducted lengthy ethnographic research with skilled birth attendants in a maternity ward in a large hospital in rural Tanzania. In her 2017 article, Strong describes the difficult working conditions midwives face due to budget shortfalls and lack of donor funding, which lead to a scarcity of tools and medicines needed to conduct the work required. She also describes the potentially dangerous working conditions due to a lack of personal protective equipment and details how she and the SBAs at the

[3] Initially an acronym meaning the Johns Hopkins Program for International Education in Gynecology and Obstetrics, it is now a non-profit organization simply known as JHPIEGO but is still affiliated with Johns Hopkins and continues to conduct maternal health-focused programming internationally.

hospital regularly came into contact with a variety of bodily fluids while on the maternity ward (Strong, 2018).

Women who attend births have always been holders of authoritative knowledge, and their knowledge is consistent with local constructions of reproductive risk. Chapman (2010) argues that women in Mozambique have more trust in TBAs because they hold authoritative knowledge about therapeutic processes that address the unofficial risks they face in their pregnancies. TBAs can provide more meaningful care because they address the full spectrum of women's experiences with reproductive risks. Wall (2012) also discusses the importance of trust, particularly in regards to obstetric emergencies. A trust of SBAs needs to be present to help mitigate any delay in seeking biomedical care during events such as prolonged labor (Wall, 2012). Additionally, in areas where TBAs are seen as holding more authoritative knowledge than SBAs, women will continue to utilize the birth attendant they prefer (the TBA) and not deliver in a biomedical facility. Therefore, while women are aware of the presence of reproductive healthcare, they may opt not to utilize it.

The themes of authoritative knowledge, risks in reproduction, and access to care arise again and again in anthropological analyses of global maternal health programming. Global health programs that aim to improve maternal health outcomes should consider things like the authority of biomedicine, what constitutes a risk, and how classifications of risk can differ from the local definitions of those they are trying to serve. These themes can be applied more broadly to any health intervention or program. Each of these themes are described in the findings of this

dissertation, both in the discussion of obstetric care provision and in the findings regarding the assessment of the GHS's telemedicine program.

Power, Knowledge, and Technology

The anthropology of technoscience aims to understand how knowledge and power are instrumentalized through technology (Escobar, 1994; Jasanoff, 2004; Bray, 2014). Most of the work that examines gender and technoscience looks explicitly at biopower and its subjects, including interactions between experts or technicians and lay users, or lay appropriations of new disciplinary regimes. Wajcman (1993) argues that in order to fully understand the ways in which technology shapes social relations, it is necessary to get inside the 'black box' and understand how technologies are being used. Feminist STS scholars in the 1990s tended to take a constructivist approach to understand this, rather than focusing on empirical data collection. These feminist STS constructivists were focused on theorizing how technologies are socially constructed (Faulkner, 2001; Bray 2014). This dissertation aims to move this field forward by using empirical data, rather than theory alone, to examine how a device is used to influence social relations.

This research project examines the ways in which telemedicine allows for access to and dissemination of knowledge. Fischer (2007) calls for anthropologists to expand science and technology studies to examine "networked worlds," which will assess how a networked technology, be it computers, the internet, or in this case, telemedicine, impacts social networks. An important body of work relating to networks and STS is actor network theory (ANT). Developed in the 1980s by Michel Callon, Bruno Latour and John Law, ANT suggests that non-human actors should be

considered in networks, as they also exert influence on human actors (Callon, 1986; Latour, 1996). This bi-directional influence is also sometimes called material semiotics (Law, 2007). My research studies networks by examining the ways in which users adapt technology, and how the technology also influences how the users, in this case, health care workers, utilize it.

This research investigates whether the introduction of a new technology impacts power within the social dynamics of healthcare systems. “Power” is a difficult concept to define and analyze. Yanagisako and Delaney (1995) explain that power is located within cultural narratives of gender, kinship, race, and religion, which, taken as a whole, create a larger narrative wherein imbalances of social standing appear logical and legitimate. Power can also be defined as the ability to act, to define narratives, to make decisions, and to influence how strategies and policies are implemented and adapted over time. The availability of a technology that offers a nexus of care such as telemedicine is still imbued in standard power dynamics and authoritative knowledge at various levels of social networks in the study setting.

Similar to the theories of the medicalization of birth discussed above, some STS scholars discuss the ways in which technology is used to appropriate more authority to doctors (mainly men) because possessing technical knowledge and skill means doctors are regarded as experts (Rapp, 1998; Davis-Floyd & Sargent, 1997; Fraser, 1998). Fraser (1998) details the ways in which public health messaging denounced African American midwives in the South in the 1930s, suggesting women should go to doctors (i.e., white males) instead because they have medical

technology. Rapp (1998) takes a different approach to it and suggests that patients, as medical consumers, can also become experts of a biomedical technology. She discusses this within the context of prenatal diagnosis, and provides examples of patients who become more or less lay experts in the technology to decide whether or not they want the procedure, therefore giving them more power.

Early feminist STS scholarship drew attention to the fact that one's gender (as well as race and class) can influence how they perceive the world and thus how they conduct their work, something that was previously assumed not to influence the objectivity of science (Keller, 1984). An important concept within feminist STS is situated knowledges. Haraway (1988) argues there is no such thing as a singular "knowledge," but rather, it is important to consider the positioning, or grounding, of that knowledge so that it is understood from where knowledge was produced. Essentially, she argues there is not one 'correct' answer, truth, or science, but that science produces knowledge that is valid within certain contexts and frames of analysis (Haraway, 1988; Berg & Lie, 1995). The theory of situated knowledges, then, argues that one's social location "systematically shapes and limits what we know, including tacit experiential knowledge as well as explicit understanding, what we take knowledge to be as well as specific epistemic content" (Wylie, 2003: 28). In regards to this research, this is relevant in considering not only the biomedical training of the various actors (nurses, midwives, and doctors), but also other local knowledges about risk, pregnancy, and care more generally.

Postcolonial Science and Technology Studies

This study draws from and contributes to the theoretical field of postcolonial science and technology studies (STS). This subfield of STS examines new configurations of science and technology in postcolonial locations to better understand how these fields operate in different cultures and contexts (Anderson, 2002; Goldberg & Quayson, 2002; Anderson & Adams, 2008). Postcolonial STS challenges many binaries, such as Western/Indigenous, first-world/third-world, and modern/traditional. Just as no technology is truly universal or global, they also do not operate in dichotomous ways (for example, there is not a first-world way and a third-world way to implement telemedicine). Postcolonial STS scholars also challenge the notion that science and technology are diffused in unidirectional ways (Harding, 2009; Harding, 2014; Pollock & Subramaniam, 2016). This dissertation supports that claim by providing an example in which telemedicine programs do not have a unidirectional impact on healthcare workers. Rather, it demonstrates the ways in which technology is modified by users to fit their needs.

There are many overlapping themes between feminist STS and postcolonial STS, and scholars from each arena began to recognize the importance of the perspectives of the other beginning in the late 2000s. Both theories argue that science and technology are not neutral, but rather can be strong political tools. Both examine how control of science and technology can be an exertion of power. For feminist STS, this is examined in how white men dominate scientific fields and how technologies are gendered, therefore keeping women subordinate. Postcolonial STS addresses the concept of power by examining how colonizers and former colonizers

access to science and technology or, inversely, former colonies' lack of access to science and technology maintains advantageous economic and political relations for the former colonizers.

Both theoretical perspectives argue that the current Western, androcentric science and technology philosophies do not serve their particular constituents (Harding, 2009). Feminist STS literature has largely been centered in the US and Europe and rarely acknowledges the experiences of women in non-Western settings. Postcolonial STS has been criticized for largely ignoring gender in its canon, presuming science and technology are gender-free, or at least do not have impacts on experiences of women. Slowly, both of these theoretical arenas have recognized these limitations, and there has been a shift towards a more holistic theory.

In the past decade, postcolonial STS has begun to acknowledge the importance of studying not only geography, race, and class, but also needing to incorporate gender (Anderson & Adams, 2008). Mohanty (1988) critiqued the ways feminist scholars portrayed Third World women in the 1980s, but it wasn't until the 2000s that feminist STS began to really focus on women in non-Western settings. Finally, the burgeoning interdisciplinary theory of postcolonial feminist STS has "established the centrality of gender, race, sexuality, nation, and other structures of inequality as profound influences on all aspects of the society" (Pollock & Sumbramaniam, 2016: 952).

More women scholars are beginning to write about postcolonial issues. A previous critique of the field was that nearly all those writing about postcolonial STS were men. Sandra Harding, Donna Haraway, Banu Subramaniam and others were

some of the first feminist scholars to begin discussing how to unite the two theoretical areas. Harding (2008) was one of the first to push for an integrated theory. She draws upon her previous work in both feminist STS and postcolonial STS as a prelude to discuss feminist postcolonial standpoints. Using Mohanty (1988) as support for her argument, she rejects stereotypes of the Third World woman as homogenizing and essentializing. She argues only feminist, postcolonial and postpositivist theories have treated third world women as fully human, but suggests that an integration of feminist and postcolonial theories would provide a more holistic "standpoint" from which to examine the experiences of such women. She suggests standpoint theory is appropriate because it 'studies up' and are not just the perspectives of the subjects, but couches them within the political and social contexts.

Science and medicine were widely seen as gifts colonizers bestowed upon subjugated populations as part of their 'civilizing mission,' and thus are ripe areas from which to analyze the impact of colonial legacies (Seth, 2009). Some postcolonial STS scholars suggest that colonial medicine is a form of hegemony because it creates an acceptance of the colonizers because of their provision of medicine, rather than needing to control subjects through force (Arnold, 1993). For instance, in 19th century India the British colonial medical system controlled its subordinates by keeping Indian subjects healthy enough to work and 'evangelizing' Western medicine (Arnold, 1993). Comaroff and Comaroff (1991) provide an excellent summary of this period when they state:

> What began the period as an explicit discourse on moral economy ended it, at least in hegemonic form, as biomedicine; what was

> formerly couched as Christian well-being came to be spoken of in the assertive language of science. This transformation was implicated in significant, epochal shifts in the nature of knowledge, authority, and sovereignty. It was to make medicine into the archetypal profession and enable it, with the backing of the state, to replace the church as the guardian of 'health,' public and private (Comaroff and Comaroff, 1991: 325).

While scholars have studied the impacts of colonial medicine and Christian conversion of colonized populations separately, the influence of Christianity in the provision of care by a formerly-colonized population is rarely discussed in the literature.

An area in which postcolonial STS is lacking is in practical application regarding translation of technology. One exception to this statement is the infamous "The Zimbabwe Bush Pump: Mechanics of a Fluid Technology" by de Laet and Mol (2000). This article was an analysis of the 'appropriateness' of a technology. The authors explain that the Zimbabwe bush pump is technologically a 'good' pump: easy to install, well made, and fairly easy to repair. However, the designers of the pump failed to consider reasons why the pump might not work for a community, and the repercussions of this. This article is a rare example of STS work that transcended theoretical silos, as it is widely cited by scholars from a range of disciplines. It is an example of how STS theory can be applied to study technology as well as politics in a way that can be applicable to a wider audience.

Scholarship such as this regarding the translation, transaction, and transformation of science and technology in postcolonial settings is too few and far between. Most of the literature in postcolonial STS examines broader ideas such as the geography of science or indigenous knowledge that can be couched within a

situational context, but it is examined theoretically rather than empirically. Some of the postcolonial STS literature calls for more incorporation of local knowledge into technology practices, much like international health literature does.

Primary Health Care and Health Systems Strengthening

Telemedicine is being integrated into the GHS cadre of care as a way to strengthen the health system. *Health systems strengthening* broadly refers to efforts to improve health systems, and can be manifested in different ways, including improving infrastructure and policy, and trying to achieve universal health coverage. This section provides an overview of the development of global health policies that have shaped the GHS system, and ultimately created the possibility, as well as need, for teleconsultation.

Shortly after former African colonies gained independence, these new nations began to build networks of health services in rural and remotes areas in an attempt to strengthen their health systems (Bennett, 2011). This effort was acknowledged and bolstered by the Declaration of Alma Ata, which laid out a series of points to address some of the major health inequities worldwide. The Declaration asserted a new definition of health, which is the "state of complete physical, mental, and social wellbeing, and not merely the absence of disease and infirmity" (World Health Organization, 1978). Conference members agreed on the goal of health for all by the year 2000, which they argued could be achieved through universal health coverage. The idea of primary health care (PHC) was conceived as a way to provide universal health coverage. In order to implement PHC, there was a focus on governmental responsibility. To achieve this, a horizontal model of care delivery was

suggested. Horizontal health programs provide general services and prevention for all health conditions through government-funded health systems that relied largely on a cadre of unpaid community health volunteers (Bennett, 2011). An example of a horizontal program is routine immunizations for children under five. A benefit of this type of programming is that it provides preventative services to populations that are unable to pay for private care (Msuya, 2005).

There were near immediate critiques of the PHC model, in which scholars acknowledged the value of the goal of health for all, but argued that it is too lofty and therefore unattainable. Instead, they offered an alternative to PHC, which they called selective primary healthcare (SPHC, Walsh & Warren, 1979). SPHC focuses on specific diseases and technological solutions through a "vertical" model of programming that had been previously proven to be successful due to the model's emphasis on monitoring and evaluation and measuring target indicators. This model was preferable to PHC because it was more immediately feasible to implement (Storeng & Béhague, 2014). Walsh and Warren (1979) suggested that the top priority diseases for SPHC programs moving forward should be: diarrheal diseases, measles, malaria, whooping cough, schistosomiasis, and neonatal tetanus, and that the best way to tackle the high priority diseases is to target women in childbearing years and children under 5. The Safe Motherhood Initiative, detailed above, is an example of SPHC targeting women. Other examples of SPHC are eradication programs focused on specific diseases such as measles.

Global economic crises around the world in the 1980s led international financial institutions to resort to structural adjustment programs to help

governments restructure their economies to reduce inflation, stimulate economic growth, and begin to repay their international debt (Bennett, 2011; Pfeiffer & Chapman, 2010). Structural adjustment programs required indebted nations to drastically reduce their spending on public programs such as health care (Ferguson, 2006). As funds for public health systems diminished, so did the services they provided. A flood of private sector NGOs rushed in to fill the gaps, but with a market-oriented approach (Ferguson, 2006; Bennett, 2011). This model, popular in many places in the 1980s and 1990s, instituted user fees and higher costs for care, which rapidly increased health inequities globally.

By the late 1990s, it became clear that health for all would not be achieved by 2000. Therefore, the UN introduced the Millennium Development Goals (MDGs), which had goals that were very similar to vertical programs seen in health care, though the goals did not exclusively focus on health. Each goal had defined indicators and target reduction numbers. One of the eight goals of the MDGs was to improve maternal health, with the lofty goal of reducing maternal mortality by 75% by the year 2015. In actuality, a reduction of 45% from 1990 was achieved by 2015 (United Nations, 2015). The Sustainable Development Goals (SDGs), which superseded the MDGs in 2015, incorporated many health goals into one category. The first target of the health-focused goal is to reduce the global maternal mortality ratio to less than 70 per 100,000 by 2030. A key indicator for this target is the proportion of birth attended by a skilled health professional. The SDGs are much broader than the MDGs in terms of the health goals, and the targets are intended to cover all major health topics and aim to achieve universal health coverage (World

Health Organization, 2016c). This was a prominent shift in global health programming, demonstrating the first global effort to return to the horizontal model of PHC, rather than continuing to focus on the vertical SPHC.

Like many other African countries post-independence, Ghana began building health facilities throughout the country in the 1960s. Health was a priority for Ghana's first president, President Kwame Nkrumah, who instituted free hospital care (Böhmig, 2010). However, following the coup that ousted President Nkrumah, the country experienced decades of political turmoil and economic instability. This had implications for the health system, including a severe shortage of health care professionals and a favoring of urban hospitals over rural facilities (Böhmig, 2010). The focus on hospitals meant that curative care was favored over preventative care, which perpetuated health problems for many in rural Ghana (Fosu, 1989). The GHS finally began to address the need for primary and preventative care in the rural parts of the country in the early 2000s (through the CHPS compounds system, discussed in detail in Chapter Three), but the country is still far from achieving the goal of health for all.

The GHS began its implementation of the national telemedicine program in 2016 as a way to bolster the primary health care system throughout the country, as it can be used for teleconsultation regarding all health concerns. Additionally, it is intended to be a resource for community health officers, who are the ones providing routine immunizations and other horizontal health programming. By improving the capacity of those at the periphery through telemedicine, the GHS hopes to come closer to the goal of achieving universal health coverage.

Significance of this work

While there has been much written about TBAs, there has thus far been very limited empirical studies conducted on SBAs. This dissertation addresses to this dearth in the literature as it is based on 12 months spent with midwives, studying them and the work that they do. As pregnancy and delivery are inherently risky periods of time, those who attend to these women must mitigate risk daily. Identifying how they deal with risk, understand risk, and negotiate care when their patients may define risk differently is essential in order to appraise the obstetric care that is being provided after so many years of global health interventions and scrutiny. Additionally, this dissertation adds to the very limited field of anthropological studies of eHealth programs, and is one of very few ethnographic studies regarding a large-scale eHealth program within a health system. Finally, it is also a much-needed example of real-world application of theories of postcolonial science and technology studies.

Organization of Dissertation

Chapter Two details the methods for data collection. There were four types of data collected: field notes, which encompassed data from participant observation and unstructured interviews at a health center in a rural town; semi-structured interviews with GHS administrators involved in the implementation of the national telemedicine project; transcripts from a WhatsApp group for midwives in the district in which I was working; and a focus group with midwives in the district. This chapter provides a summary of each type of data and details the data analysis.

Chapter Three provides an overview of the study setting. It describes the organizational and social structures of the Ghana Health Service and provides data on health indicators. Then, I describe the setting where this research took place, beginning with an overview of the region, followed by the district, and ultimately, a description of the health facility where I spent the majority of my time. The final piece to contextualize the setting is an overview of the cultural milieu of obstetric care seeking in Ghana, drawing upon literature from other scholars who have also studied the subject.

Chapter Four examines the formal telemedicine system that GHS is attempting to integrate into its cadre of care. Initial observations through my participant observation at the health center indicated that the system was not being utilized much in this region. The semi-structured interviews with the GHS administrators at the national, regional, and district levels provided information regarding how the program was being implemented, which shed light on why the system was being so underutilized.

An interesting finding discussed in Chapter Four is the adoption of WhatsApp for teleconsultation. Chapter Five describes this subject in more depth, and examines a WhatsApp group or "platform" used by midwives for teleconsultation. In this chapter, I discuss how the platform is being used and the themes that arise on it. Domestication of technology theories from STS literature provide an overarching framework to understand how the group is adopting and adapting a messaging app to suit the need for teleconsultation. As stated earlier in this section, the majority of my time over the course of my fieldwork was spent at a rural health center in the

maternity ward with midwives. The second half of this chapter details what work and life is like in a rural maternity ward, particularly focusing on themes of risk, uncertainty, and the use of technology. Ethnographic vignettes are used to provide more context for the conditions under which midwives are working, and the setting in which teleconsultation is being utilized for obstetric care.

Chapter Six weaves together the themes that emerge through the findings to assess the use of teleconsultation for obstetric care, and more broadly, health systems strengthening. This section summarizes major conclusions and discusses the implications of this research as telemedicine and eHealth projects continue to be implemented in similar settings globally.

Chapter Two
Methods

This research occurred over twelve months, from March 2018 to March 2019. The study design evolved over the course of the year in order to achieve the study aims, which were to 1) understand how telemedicine is being used in regards to obstetric care provision, and 2) explore the complexities of bureaucratic, technological, hierarchical, and social systems of the Ghana Health Service (GHS) and telemedicine programs in Ghana. Data collection consisted of participant observation, semi-structured interviews, monitoring a WhatsApp group, and a focus group. Each of the data collection components and the participants involved are detailed below in Table 2.1:

Research Component	**Participants**
Participant observation	33 staff from the Health Center, surrounding CHPS compounds and specialty clinic in Bongo District; the District Health Assembly in Bongo; and the teleconsultation center in Bolgatanga
Semi-structured interviews	13 Administrators from the national (5), regional (3), and district (5) levels of GHS
WhatsApp data	68 members of the WhatsApp group, including midwives, physicians, administrative staff, and the teleconsultation center manager
Focus group	24 midwives from District Hospital, Health Centers, and CHPS compounds

Table 2.1: Types of data collected and participants

Participant Observation and Unstructured Interviews

Participation observation and unstructured interviews were the primary data collection methods. My participant observation and unstructured interviews focused on the following deductive themes: use of technology (both phones for telemedicine

as well as other technologies), opinions on the previous telemedicine pilot project that occurred in the district, emergency cases, referrals, work expectations for nurses, hierarchy of the GHS system, obstetric care, and local traditions/beliefs about pregnancy, delivery, and the postpartum period.

The majority of my research focused on the midwives because of their primary role in obstetric care. Therefore, I began conducting participant observation in the maternity ward. This was done first in order to build rapport with the midwives and to allow patients to become familiar with my presence. The in-charge of the facility formally introduced me to both midwives, and I gave them the informed consent document and explained why I was there. Both accepted me graciously and were accommodating from the start. Because I had permission from the regional and district administration offices and from the in-charge of the health center, as well as permission from the midwives to be in the maternity ward, the "clients," or patients, accepted my presence as part of the health center team. Clients were not consented, as I interacted very little with them directly, but they were informed of who I was and why I was there if they asked. To respect the clients' privacy, I made it clear that I would leave the room should any of them ask for me to do so; however, none did.

Participant Observation

Most days, I would arrive at the clinic around 9:00 AM and head to the maternity ward, where I would sit in a corner of the antenatal room and observe as the midwives and occasionally other nurses attended to clients. Eventually, one midwife taught me how to log client information in the antenatal register on the

desk so that I could be of help, and another taught me how to fill out the health insurance forms. By assisting with paperwork, I not only freed up some of the midwives' time to focus on their clients, but I also gained an understanding of the tedium of some of their work. Throughout the day, I would make notes on my phone. Being on my phone was much less conspicuous than writing notes in a notebook, as it appeared that I was just texting or checking social media, and was, therefore, less disruptive. At the end of each day, I would transfer my notes into a Word document and write more detailed fieldnotes.

I also conducted participant observation at the teleconsultation center (TCC) in Bolgatanga. I visited the TCC roughly once a month, visiting 14 times total over the year I was there. I would spend between 1-2 hours there each time I visited. During my visits to the TCC, I never saw a call being received.

Unstructured Interviews

Unstructured interviews were designed to allow the participants to speak about what is important to them, rather than answer predetermined questions. Much of what they talked about was unrelated to telemedicine or maternal health, but related to the broader context of health in this particular setting and provided important insight into their caregiving experiences. When it was appropriate, I would ask the midwives questions, or they would volunteer information to me, such as translating something a client said or explaining a condition the client had. The afternoons proved to be a good time to conduct the majority of my unstructured interviews. The midwives would typically finish seeing their patients by 2:00 PM, and in the downtime I asked more detailed questions regarding the topics mentioned

above. I also used this time to ask further questions about cases earlier in the day to gain better understanding of what transpired or why the midwife chose the course of action she did.

I also conducted unstructured interviews at the TCC. When visiting the TCC, I would ask the manager and other employees about their workload, the number of calls received, what types of cases would be called in, trainings about the program, and their perceptions of how the program was being received at the community level. I also reviewed documentation of prior calls. Based on these visits to the TCC, in addition to conversations I had with the staff at Tiisi, it was clear that the telemedicine system was not being used as expected. Additionally, conversations with the TCC manager made it clear that there weren't many calls to the TCC specifically for obstetric cases.

Semi-Structured Interviews

Realizing that the telemedicine program/TCC was hardly being utilized, and particularly not for maternal health, illuminated a disconnect between the national-level narrative of how the program was working and the experiences of the end users. Therefore, I interviewed administrators at each level of the GHS system to better understand why this program was not being taken up as intended. These interviews took place in September and October 2018.

Semi-structured interviews were conducted with all of the people who are actively involved in running the telemedicine program at the national, regional, and district offices of GHS. Interviews occurred at the participants' offices. The interview

guide was pre-tested and all interviews were conducted in English and audio recorded with consent. Interviews lasted one hour on average and prompted participants to describe the structure of the program and how the implementation was carried out, detail the goals of the program, discuss its strengths and weaknesses, mention various resources available to support the program, compare the program to the previous pilot project which this program was based on, detail how trainings are carried out, and describe how the program is monitored and evaluated for consistency to the program model.

Participants

Thirteen administrators completed a semi-structured interview. At the national level, four employees of GHS and one outside consultant were interviewed in Accra. At the regional level, two members of the regional administrative GHS staff in Bolgatanga and one employee at the Upper East Regional Hospital were interviewed. I visited three districts in the Upper East Region, and district-level participants included three health directors, the referral coordinator for one district, and one physician at a district hospital.

One district was selected because it was the site of the pilot project and was therefore the most familiar with telemedicine. A second district was selected because the TCC had received zero calls from that district at the time of the study, and therefore provided a case example of non-utilizers. The last district was selected because it was the most frequent utilizer of the TCC.

WhatsApp Data

Not long after I began the study, I learned that the midwives were using WhatsApp to report referrals to the district hospital. They would discuss things they saw on "the platform," which I eventually learned was a WhatsApp group specifically for midwives in Bongo District to post cases and pertinent information for their work. The group, called "Labour Ward," is moderated by the medical superintendent at the Bongo District Hospital. I submitted an addendum to both the CWRU and local IRB and received permission to be added to the platform. In October, I met with the medical superintendent to explain my research and asked if he would be willing to add me to the platform. He agreed, and informed all the members of my presence. Boellstorff and colleagues (2012) suggest digital data such as this should be treated as another form of participant observation, as it allows the ethnographer to be both part of the group as well as observe the natural social order. I did as they suggested, and I was always a silent observer. Rather than writing fieldnotes about what transpired, as I would with standard participant observation, I used transcripts of the exact conversations for data analysis.

Participants

When I was added to the platform, there were 49 members other than myself. Over the course of a year, 17 more people were added to this platform, but a handful have left. The nature of WhatsApp allows people to be mostly anonymous, with no identifiers other than phone numbers. Once a person sends a message to the group, you can see the name people have called themselves in the Settings

section of the app, but you do not have to put your real name[4]. Therefore, I cannot say how many members of the group were midwives, or more specifically, midwives from subdistricts or the district hospital. However, when posting a referral case, midwives would sometimes state where they are referring from, but I did not attempt to correlate phone numbers with locations. This was a conscious decision to ensure anonymity among the participants in the data that I collected. I did, however, keep notes regarding if each group member participated, and how often they participated.

Focus Group

A focus group was conducted with midwives in Bongo District regarding the Labour Ward Platform. This focus group occurred in March 2019. Even though the midwives were informed of my presence on the platform, I chose to hold the focus group at the very end of my study because I didn't want questions that arose from the focus group to influence how they used the platform. Therefore, I allowed myself to be a silent observer of the platform for roughly six months before gathering midwives to talk about their utilization and perceptions of the platform.

The focus group occurred at the district hospital in the conference room. The midwives were asked about what the platform is, how they use it, and their perceptions of it. In all, 24 midwives participated, and it was mixed between hospital midwives and midwives from clinics in the district. The focus group was audio recorded.

[4] For instance, your name can be "Mrs. Jones," or as a nickname like "Princess." This adds a layer of anonymity.

Data Analysis

All audio recordings of interviews and the focus group were transcribed and de-identified. For the WhatsApp data, posts to the platform were transcribed verbatim into Word documents and de-identified. Participants were originally identified by their phone numbers, and each phone number was given a randomized identification number. Any identifying information about location was removed and labeled as "[Redacted]".

The transcriptions were qualitatively analyzed using inductive content analysis (Elo & Kyngäs, 2008) in Atlas.ti (Version 8.3, 2019). Data were initially analyzed using open coding. All transcripts were read and sections of text were coded by theme. Code books for each type of data were created inductively, meaning new codes were added as coding progressed (Charmaz, 2014). Data from the participant observation informed the creation of the semi-structured interview guide for the administrator interviews. Data from field notes and WhatsApp transcriptions informed the creation of the focus group guide.

The next step of analysis for each type of data was to examine the codes that emerged and arranging them into code groups based on identified patterns (Boellstorff et al., 2012; Charmaz, 2014). The higher-level themes of the code groups were analyzed as units, meaning each code group was examined as a whole beginning with the groups that had the highest total number of frequencies and were therefore the most prominent themes. I read through all of the quotations associated with the codes, starting with the most frequent themes to look for patterns in what the participants had to say.

This method of inductive coding, followed by grouping the codes thematically and examining both the topics that were most common in the larger theme as well as searching for patterns within each sub-theme was carried out for each type of data collected. Patterns were highlighted in word documents with additional comments. At this point, prominent code groups, codes, and quotes within codes were reviewed again and examined in relation to theories that help to understand patterns in the data.

Limitations

One limitation of this study is that it occurred mainly at one health facility. However, the data from the WhatsApp platform provided a broader sample, and indicated that the types of cases seen at Tiisi were typical for the area. Additionally, by focusing on the one health center, it was possible to have a more in-depth understanding of the quotidian work of the facility. A limitation of the focus group is that it became much larger than intended, but I did not want to turn participants away, so all were allowed to stay. This is a limitation because the recommended sample size is generally no more than 10 participants (Bernard, 2011). Additionally, holding the focus group at the District Hospital may have impacted some of the participants' willingness to speak completely openly. However, during the focus group, various parts of the room were called upon to provide answers to the questions posed, and midwives from the subdistricts were specifically asked to answer questions to ensure that perspectives from both the health facilities and the hospital were being heard. A limitation of the WhatsApp data was that it was anonymous and therefore did not allow for follow-up from posts other than those

from Tiisi. Responses from the focus group reflected data previously collected from Tiisi Health Center, confirming there was consistency in the perspectives amongst health care staff in the district, and therefore follow-up with the midwives at Tiisi regarding cases seen on the platform was sufficient.

Ethics Approval

Prior to leaving for Ghana, I received ethics approval from the Case Western Reserve University IRB Review board (Study Number IRB-2017-2084). In April 2018, I received approval from the Navrongo Health Research Centre (Study number NHRCIRB-300). Throughout my time in Ghana, I submitted addenda to both IRBs as my study plan changed. All research was conducted in English.

Chapter Three
Setting Description

This chapter provides an overview of the Ghana Health Service system structure, description of the workforce, and health indicator data from Ghana, as well as background context on the Upper East Region, followed by descriptions of Bongo District and the Tiisi Health Center, and finally, an overview of the cultural context of obstetric health care seeking in Ghana.

Social Hierarchies and Gender Distribution in the Ghana Health Service

Respecting hierarchy is an important aspect of social life in Ghana. This is first learned in the household, where multiple generations typically live together and the young must show respect for the old (Böhmig, 2010). Within communities, elders (both those of elderly age and elected "elder" representatives for the chief) are shown deference for their traditional knowledge, wisdom, and life experiences (Böhmig, 2010). Though older women are generally treated with respect, women typically have a lower social status than men in Ghanaian society. Women are generally expected to perform all household chores, including cooking, cleaning, fetching water, and caring for children. Women are also expected to assume a caregiver role, not only for children, but also for the elderly and to serve their husband's needs, even if she also has a job outside the home.

Given their roles as a caregivers and positions in social hierarchies, it is not surprising that many nurses are women. Notably, however, although nursing is seen as a natural female profession in many parts of the world, in Ghana many men also

become nurses. Historically, the first Ghanaian nurses were all male because the training provided by the British colonizers required formal education and literacy in English, which was not provided to most girls (Böhmig, 2010). Additionally, women were expected to complete household chores, which kept them in the compound all day. Leaving the household to care for strangers did not align with traditional Ghanaian values (Böhmig, 2010).

Women were first introduced into a biomedical nursing role as midwives, because caring for women during delivery has always been a role fulfilled by other women. The first midwifery school opened in Accra in 1928 with a curriculum reflective of British midwifery training system. The Midwives Ordinance was created in 1931 to oversee the training, examination, registration, and practice of midwives in the Gold Coast, as Ghana was known when it was still a British colony (Opare & Mill, 2000). Ghanaian nurses and midwives worked alongside British women and associated their uniforms with power, and thus, nursing and midwifery slowly became a prestigious profession for Ghanaian women (Böhmig, 2010).

Ghana faced numerous obstacles to building its own system of nurse and midwifery training post-independence, including a shortage of nurse tutors (trainers), lack of books and supplies, and a struggle to build an efficient training model that was suitable for the trainees who were educated under a rote memorization system but needed to learn problem solving and critical thinking skills (Opare & Mill, 2000). Through the decades, training colleges have adapted to build a broad education system that trains nurses and midwives to work in a variety of settings and conditions (Opare & Mill, 2000). Today, women make up the majority of

the entire Ghanaian Ministry of Health workforce (59% total), where the majority of nursing professionals are female (77%), with an even greater percentage of nursing associate professionals being female (88%), and 100% of midwives are female (Ghana Health Workforce Observatory, 2011).

The role of the physician in Ghana remains largely dominated by men. A report on gender distribution of the health sector for 2010 stated that 28% of generalist physicians in the public sector were female and 72% were male (Ghana Health Workforce Observatory, 2011). This is on par for the entire African region, which has an average of 28% female physicians (Boniol et al., 2019). However, for specialist medical practitioners in Ghana, the percent of females is even lower at 21% (Ghana Health Workforce Observatory, 2011). In a study regarding the likelihood of rural practice among Ghanaian medical students, Kotha et al.'s (2012) sample from Ghana's three medical schools contained 73 female students (32.2% of total students), only 29 (39.7% of female students) of whom stated they would be willing to work in a remote or deprived area (Kotha et al., 2012). This means that of the entire survey sample (N=228), only 12.7% were female and willing to work in a rural area. By contrast, 66.2% of the male sample stated they would be willing to work in a deprived area, which is 44.7% of the entire medical student sample. Thus, not only are men much more likely to become physicians, they are also much more willing to work in rural areas of Ghana. These results were reflected in my observations during my study, where all the physicians I met and interacted with were male, and the majority of the staff at Tiisi Health Center were female (see Appendix 1 for a breakdown of gender among participants).

Ghana Health Service Structure

The Ghana Health Service (GHS) is the national health system that provides both clinical care and administrative support to the various facilities and national health programming. Administratively, GHS has offices at the national, regional, and district level that implement, oversee, and evaluate health services. GHS provides clinical care via health facilities at the regional, district, sub-district, and community levels. At the regional level, there are regional hospitals operated by GHS. At the district level, GHS has district hospitals and some specialty health facilities. Larger clinics, known as health centers, operate at the sub-district level (which typically have services such as a laboratory, pharmacy, and labor wards), while Community-based Health Planning Services (CHPS) Compounds are small facilities found at the community level. The CHPS compounds only provide the most basic level of care, functioning primarily as preventative services, such as providing family planning and child health outreach and only employ a handful of staff.

CHPS Compounds

Ghana has a history of scaling up successful pilot projects and integrating them into the health system, as it did with its CHPS compounds beginning in the mid-1990s (Nyonator et al., 2005a; Binka et al., 2007; Awoonor-Williams et al., 2013; Kumholz et al., 2015). In 1994, health researchers and administrators began a decade-long, horizontal-model pilot project in the Kassena/Nankana District in the Upper East Region aimed at increasing health coverage. The project was modeled on a national program that had previously been implemented in Bangladesh with the goal of creating a model of community-engaged primary health care (Awoonor-

Williams et al., 2013). The goal of the CHPS project was to re-orient primary health care from being clinic-focused to community-based care (Nyonator et al., 2005b).

Community members and health care workers in Kassena/Nankana District were consulted in the CHPS design process to create a culturally appropriate system for health programming and communication supported by community volunteerism. Instead of relying on untrained and unpaid volunteers, GHS created a certificate program for people to become Community Health Officers (CHOs), the lowest-ranking form of a nurse, to provide more professional care (Nyonator et al., 2005a). The idea behind this model was to have the CHOs conduct outreach in the communities to provide reproductive and child health services, rather than having nurses waiting at health facilities for community members to seek them out. The pilot project had impressive results of improving child survival and reducing fertility rates in the pilot district; however, it was debated whether or not the program was replicable at a national scale (Nyonator et al., 2005a; Awoonor-Williams et al., 2013). Therefore, the model was introduced into the Nkwanta District in Volta Region, an area that is ecologically and culturally different than Kassena/Nankana District. Lessons learned from translating the project to Nkwanta District helped to create the national system now known as CHPS compounds or CHPS clinics. The CHOs posted at the CHPS compounds are the target utilizers of the national telemedicine program.

Referral System

Just as there is a clear hierarchy for health facilities within the GHS, there also is a clear hierarchy for referring patients when a case cannot be appropriately

managed at any given level. Typically, a patient is referred up to the next proximate level of care: so CHPS compounds refer patients to health centers, which refer patients to district hospitals, and so on (see Figure 3.1).

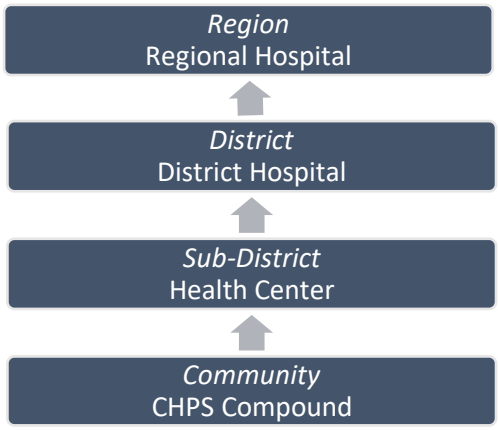


Figure 3.1: Standard pattern of referral in the GHS system, showing types of facilities at each level.

Generally, the procedure is that the referring clinic will write a referral form with biographic information and basic health data, as well as reason for referral, and tell the patient to take the form to the next level of care. Later, the facility that received the referral is supposed to write a referral feedback form and send back to the first clinic so that they know the outcome. These forms are often sent with the patients and therefore don't always reach the referring clinic if the patient does not bring it back. Alternatively, the person who referred the patient can call the receiving facility to check on their patient or go there themselves to get the referral feedback. GHS advocates for a trained health care professional to accompany the patient during the referral, or at least help to secure some sort of transport (Awoonor-Williams et al., 2015). This sometimes happens, but not always, and if someone accompanies a patient, they don't usually stay with them for very long.

Positions within the Ghana Health Service

The Ghanaian health system is based on the British health system and uses many of the same terms. These terms differ from US terminology, particularly in regards to position titles and their descriptions. Below is a table of the most common positions within the GHS at the health center level, in descending order from lowest to highest rank in the hierarchy (Table 3.1).

Job title	Roles	Training
Health Assistants	• This role is generally occupied by people who want to become CHOs or nurses but have not yet gone to nursing school • Assist nurses and midwives in whatever capacity is needed, often cleaning instruments, fetching supplies, filling out paperwork like insurance forms	On the job training
Community Health Officer (CHO)	• Role created to serve at CHPS compounds, but sometimes posted to health centers • Trained in mostly preventative care, such as vaccinations and family planning • Trained to provide antenatal care, including palpating and measuring abdomen to determine fetus size and positioning	Certificate Program – 18 months in training college, 6-month internship
Enrolled Nurse	• Fully trained nurse who can perform all the duties of a CHO, plus further training in diagnosing patients and prescribing medication	Diploma Program – 3 years of training at nurses training college
Midwife	• Same training as an enrolled nurse, plus specialty training in obstetric care • Can perform same duties as an enrolled nurse, but typically only focuses on obstetric cases	Diploma Program – 3 years of training at midwife training college

Table 3.1: Distinctions of roles within the GHS.

Health Indicators in Ghana

This section provides an overview of some health statistics to demonstrate the health status of Ghanaians, which helps to set the stage to understand the maternal health indicators provided in the following section. The first data, from the Ghana Health Service regarding the Millennium Development Goals indicators, is provided to contextualize where Ghana is in the health status of its people compared to broader areas. The provider to population ratio data demonstrates the lack of biomedical providers in Ghana, and especially highlights the variability and unequal distribution of providers in urban vs. rural areas like the Upper East Region. Additionally, Ghana's high maternal mortality rates described in the following section are often attributed to a lack of skilled birth attendants, and this data demonstrates that paucity (Ageyi-Baffour et al., 2013).

Health-Related Millennium Development Goals

Table 3.2 is a selection of some of the outcomes of the health-related Millennium Development Goals for Ghana, and compares Ghana to the African region and global averages to demonstrate how Ghana compares to other countries. Ghana has a higher mortality rate due to malaria than Africa as a region, but also has a higher rate of children under 5 who sleep under insecticide-treated nets than other parts of Africa. Ghana spends less money on health than the African average and far less than the global average, but the total percentage of expenditure that is provided by the government, rather than private entities, is much higher in Ghana than other places.

Indicator	Ghana Value	Africa Average	Global Average
Malaria mortality rate per 100,000 population	69	63	11
Children <5 sleeping under insecticide treated net	47.0	25.0	N/A
Access to improved drinking-water sources	89.8	66.0	90.0
Total expenditure on health as % of gross domestic product (2012)	5.2	5.6	8.6
General government expenditure on health as % of total expenditure on health (2011)	68.3	50.8	38.8
Per capita total expenditure on health at average exchange rate (USD) (2011)	$86	$105	$1,025
Per capita government expenditure on health at average exchange rate (USD) (2011)	$59	$53	$615

Table 3.2: Health-Related Millennium Development Goals figures (Ghana Health Service, 2018).

Provider to Population Ratios

Table 3.3 below provides statistics regarding the number of providers per population at various levels. For comparison, in 2016, the actively licensed physician to population ratio in the US was 295 physicians per 100,000 population (Young et al., 2017). In the Upper East Region, there is one doctor per every nearly 30,000 people. Therefore, there are roughly 3 physicians per 100,000 population, compared to the nearly 300 per 100,000 in the US.

	Nurse to Population Ratio	Doctor to Population Ratio	Midwife to Women of Reproductive Age Ratio
Upper East Region	1 : 422	1 : 29,675	1 : 734
Greater Accra Region	1 : 637	1 : 3,751	1 : 998
National Average	1 : 627	1 : 8,431	1 : 907

Table 3.3: Provider to Population Ratios, various levels, Ghana (Ghana Health Service, 2018).

Maternal Health Indicators

Table 3.4 provides comparisons between the Upper East Region (UER), the Greater Accra Region (GAR, a much more urban and wealthier region where the national capital is located), and the national averages as regards two indicators that reflect maternal health status. The Upper East Region has much higher fertility rates than the Greater Accra Region, as well as much higher rates of females with no education. The national average of fertility rates are more closely aligned with the Upper East Region than Greater Accra Region, as much of the country is still rural like the Upper East Region.

Indicator	1988	1993	1998	2003	2008	2014
Total Fertility Rate, UER	6.8	6.4	5.0	4.7	4.1	4.9
Total Fertility Rate, GAR	4.6	3.6	2.7	2.9	2.5	2.8
Total Fertility Rate, National Average	6.4	5.5	4.6	4.4	4.0	4.2
Percent Females with No Education, UER	81.7	66.5	69.4	72.4	49.0	40.0
Percent Females with No Education, GAR	21.9	19.4	19.6	12.4	7.7	8.3
Percent Females with No Education, National Average	39.7	38.3	34.0	28.2	21.2	19.1

Table 3.4: Maternal Health Indicators for the Upper East Region (UER), Greater Accra Region (GAR), and national averages since 1988 (Ghana Health Service, 2018).

Maternal Mortality

Table 3.5 presents the maternal mortality ratio (MMR), defined as "the number of maternal deaths during a given time period per 100,000 live births during the same time period" for Ghana and other areas across three timepoints (World Health Organization, 2019: 9). A maternal death is defined as "the death of a woman during pregnancy or within 42 days of the end of pregnancy from causes related to or aggravated by pregnancy, but not from incidental causes" (World Health Organization 2019: 8). Ghana's MMR is lower than the Sub-Saharan regional MMR, but higher than the world average. The MMR for the United States is provided in the final row to provide a comparison to a developed country.

	MMR 2000	**MMR 2010**	**MMR 2017**
World	342	248	211
Sub-Saharan Africa Region	878	635	542
Ghana	484	339	308
United States	12	15	19

Table 3.5: Maternal Mortality Ratios (MMR) for the World, Sub-Saharan Africa, Ghana, and the US since 2000 (World Health Organization, 2019).

Causes of Maternal Mortality in Ghana

There is variance in the reporting of the most prevalent causes of maternal mortality in Ghana. In a study that reports data from a hospital and a coroner in Accra, Der et al. (2013) found that the top five causes of maternal mortality reported from the coroner were: hemorrhage (23.0%), abortion (23.0%), hypertensive disorder in pregnancy (17.8%), ectopic gestation (10.4%), and infection (6.4%). The hospital, however, reported hypertensive disorder in pregnancy (29.1%) as the most

common cause of maternal mortality, followed by infection (21.4%), hemorrhage (16.2%), abortion (6.8%), and sickle cell disease (6.8%). Asamoah et al. (2011) reported on verbal autopsy data from the 2007 Ghana Maternal Health Survey. In their sample of 605 maternal deaths, they found that the most common causes of maternal mortality were: hemorrhage (22.8%), infectious diseases (13.9% - the majority being malaria-related), abortion (13.7%), miscellaneous (13.6% - includes unspecified causes, uterine rupture, complications of surgery, and embolism), other non-infectious diseases (12.4% - anemia was the most common non-infectious disease other than hypertensive disorders and sepsis), hypertensive disorders (8.9%), sepsis (6.9%), obstructed labor (4.5%), and miscarriage (3.3%). In each of these studies, hemorrhage was a leading cause of maternal mortality, which is consistent with the WHO's global report on causes of maternal mortality, which listed hemorrhage as the top factor (Say et al., 2014).

Skilled Attendance at Birth

The final indicator I discuss in this section is the percentage of deliveries that are supervised by a biomedically trained professional, which can be a doctor, nurse, or midwife. In 2003, the national average for skilled attendance at birth was 47% (Ghana Statistical Service, 2004). In 2007, 43.5% of births in the Upper East Region had skilled attendants, increasing to 67% by 2011, and was 70.1% in 2016 (Ghana Health Service, 2018). In fact, the Upper East Region reports the highest percentage of skilled attendance at birth of all the regions in Ghana. This is largely due to interventions targeting maternal health in the region, including the CHPS system and efforts by the regional GHS to increase the number of midwives in the region

through provisions such as courses for nurses who have only completed the certificate program (CHOs) to complete a short course on midwifery to become midwives.

Upper East Region Description

In 2018, Ghana created six new regions, bringing the total number of regions in the country to 16 (see Figure 3.2). Upper East Region was not affected by the new regional boundaries. As the name suggests, this region is located at the northeast corner of Ghana, sharing international borders with Burkina Faso to the north and Togo to the east. In the dry season (October – April), the average daily temperature is over 100 degrees Fahrenheit, and reaching 110 degrees is quite common, especially towards the end of the season. In the months of January – March, the area experiences *Harmattan*, which is when winds from the Sahara blow south, coating everything in a thick layer of dust. In the rainy season (May – September), the temperature is still on average 90 degrees Fahrenheit, and the peak rainy months are June – August. The average yearly rainfall for the region is 8.8 inches (Weatherspark.com, 2019).

Figure 3.2: Map of Ghana with the new regions and regional capitals (Ghanadistricts.com).

The Upper East Region is divided into 15 districts (see Figure 3.3), with Bolgatanga, often colloquially referred to as "Bolga," serving as the regional capital.

In 2017, the population of the region was roughly 1.2 million (Ghana Health Service, 2018), with nearly 80% of the population living in rural areas (Ghana Statistical Service, 2013). This region is one of the smallest in Ghana, and while districts are not geographically very far from the regional capital, poor roads and lack of transportation options mean it can take hours to travel relatively few kilometers.

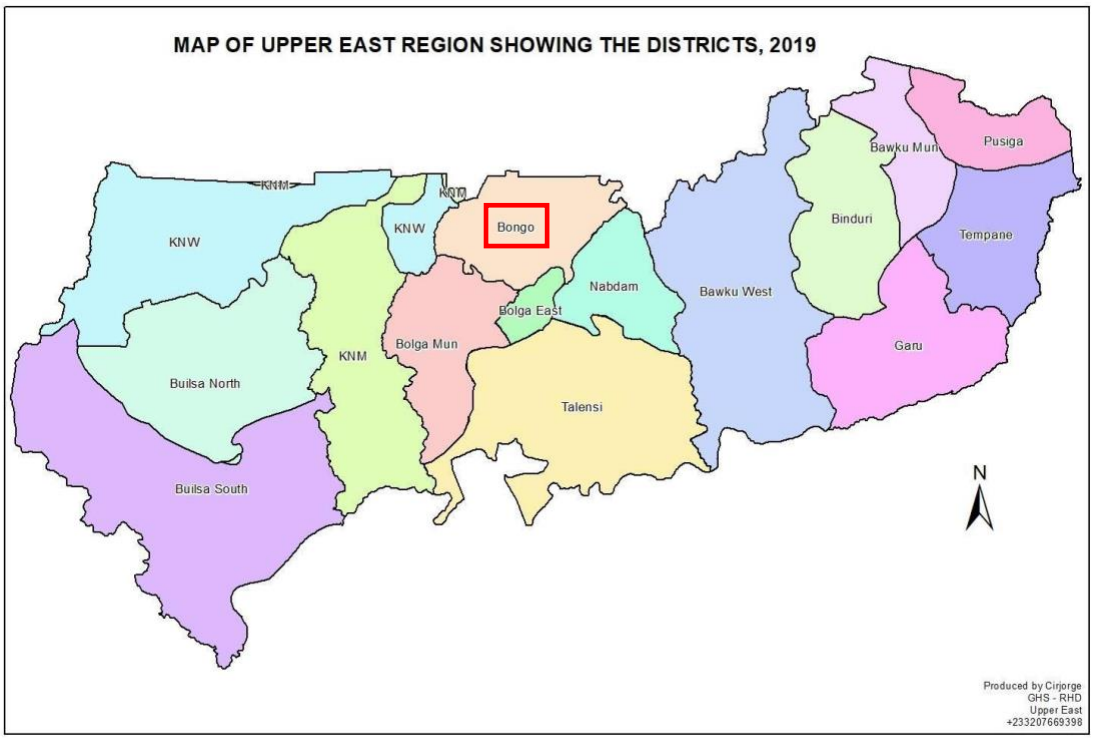


Figure 3.3: Map of districts in the Upper East Region, with Bongo District highlighted in red (Ghana Health Service Upper East Region Health Directorate, 2019).

There are only ten hospitals (large hospitals and district hospitals combined) in the region, the fewest of any region and far fewer than most regions[5] (see Table 3.6). Additionally, there is a severe shortage of physicians in the region, as there are only 45 doctors in the whole region (Ghana Health Service, 2018). However, doctors are not evenly distributed throughout the area and many of them are located at the

[5] Upper West Region, an equally under-served and remote region, only has 12 hospitals.

regional hospital, and nine districts don't have any hospitals or doctors at all (Ghana Health Service, 2018).

Region	CHPS	Clinic	District Hospital	Health Center	Hospital	Maternity Home	Polyclinic	Psychiatric Hospital
Ashanti	1122	149	25	164	128	69	1	0
Brong Ahafo	665	74	20	131	19	39	4	0
Central	364	78	12	75	17	36	3	1
Eastern	747	81	18	131	18	29	3	0
Greater Accra	498	322	8	40	99	104	14	2
Nothern	459	57	17	105	16	8	5	0
Upper East	255	46	6	55	4	2	0	0
Upper West	256	13	1	71	11	5	4	0
Volta	454	44	17	154	11	14	4	0
Western	601	134	16	78	34	40	0	0
National	5421	998	140	1004	357	346	38	3

Table 3.6: Health facilities by type and region (Ghana Health Service, 2018).

The Regional Hospital and Teleconsultation Center

The regional hospital is the largest hospital in the region and is a secondary level care facility. It is located in Bolgatanga and receives referrals from all the district hospitals. If a case is beyond the capacity of the regional hospital, it is referred to the only tertiary level care facility in northern Ghana, which is the large teaching hospital in Tamale, a major city roughly two hours south. The regional hospital also houses the teleconsultation center (TCC), which is a one-room unit in an old surgical ward (see Figure 3.4) that is designed to receive calls for over-the-phone consultation from nurses in the region. The TCC and the GHS telemedicine program are described in greater detail in Chapter Four.

Figure 3.4: Panoramic photo of teleconsultation center in Bolgatanga.

Bongo District Description

Bongo District (see Figure 3.3) occupies an area of about 460km^2 (Mantey, Mensah, & Nyarko, 2013). The district capital is also called Bongo. The district is divided into six sub-districts that encompass 132 communities and has a total population of roughly 85,000 people, with nearly 94% living in rural areas and nearly all of whom participate in subsistence farming (Ghana Statistical Service, 2014). Farms are built to surround each household compound, which means households are spread far apart and communities can be quite dispersed (see Figure 3.5 for an example of a typical household and farm area).

Figure 3.5: Typical household and farm in the area. Houses are made of mud, and many are painted with geometric designs. The area in the background does not have crops because this photo was taken in the dry season, but in the rainy season the field will be filled with millet or corn. The birds in the photo are guinea fowl, a very common fowl in the area.

Millet, guinea corn, maize, and peanuts are the predominant crops grown, as well as vegetables such as tomatoes, leafy greens, onions, hot peppers, garden

eggs[6], and beans. The major ethnic group are the Gurune, and Guruni is the language most commonly spoken. The language Guruni and the group of people called Gurune are often both referred to as "Frafra" (i.e., I am Frafra, I speak Frafra), a relic of colonial encounter when Gurunes asked colonizers, "Fara fara?" which translates to, "how is the suffering (meaning work; a common greeting similar to 'How are you?')?" Unsure what this meant, colonizers dubbed this group of people the "Frafra." There are three major religious groups in the district: Christians (48.1%), traditionalists[7] (44.0%), and Muslims (7.9%) (Ghana Statistical Service, 2014).

Bongo District has one hospital, five health centers, 36 CHPS compounds, and one reproductive health clinic (Mantey, Mensah, & Nyarko, 2013). Within the town of Bongo, there is a "District Health Assembly (DHA)," which is the administrative unit for GHS at the district level. All districts have DHAs, which are led by District Directors, and have a number of departments and staff that provide various support to the health centers and CHPS compounds within their districts.

Research Site Selection

Bongo District was selected as the area for the study because it was one of the locations for a pilot project that served as the basis for the national telemedicine program, and therefore, telemedicine had been occurring in the district for roughly six years by the time I arrived to conduct this research. The Bongo DHA assisted me

[6] Similar to a small eggplant, garden eggs are used in soups and stews.
[7] Meaning they practice traditional forms of religion and worship, including "worshipping to a supernatural god, smaller gods, honoring the ancestors and the belief in forms of witchcraft, magic and sorcery" (Böhmig, 2010: 33).

in my site selection by providing data on their health facilities. To ensure a sufficient number of possible participants, the number of pregnancies in a year was estimated as the crude birth rate (CBR) for the region (22.7/1000, Ghana Statistical Service, 2014) multiplied by the population of the community. The decision was made to seek a district with at least 100 births per year, based on the CBR. A population of 5000 results in 114 pregnancies in a year. Therefore, the selection criteria were set to be that: 1) the clinic serves a population of at least 5000, 2) the clinic conducts deliveries, and 3) the clinic utilizes the telemedicine system.

The DHA provided a document with two lists meeting my criteria: first, a list of facilities conducting deliveries in the district, and second, a list of facilities using telemedicine/consultation and the population of the area they serve. There were 15 clinics on the list that conduct deliveries, and 42 on the list of facilities that use telemedicine/consultation. All but one of the facilities conducting deliveries were also on the list that uses telemedicine (one facility was a private clinic), so I narrowed these lists down to those that conduct deliveries with a population of greater than 5000. Ultimately, four clinics met all of the selection criteria. Next, I went to the teleconsultation center in Bolgatanga and asked for a list of the facilities that call most often. The manager told me that he did not have easy access to any data regarding where calls originated from, but asked to see my list of potential sites. He said that Tiisi Health Center calls frequently, but none of the other clinics do. Therefore, Tiisi became my top choice for a research site, which the Bongo DHA approved and the Tiisi Health Center accepted my presence.

Tiisi Health Center

Tiisi[8] is a town of about 5,000 people located roughly ten kilometers from Bongo, but the road is very poor and it takes at least 30 minutes to travel that distance via motorcycle when conditions are good. In June 2018, a bridge that spans a small river collapsed after a night of heavy rain. This meant that traveling to Tiisi on the most direct road was impossible for several months, and the only way to reach Tiisi was to take an alternate road that was 15 kilometers in distance but took at least one hour to traverse. Eventually, when the river was low enough, people began to drive through the river on their motorcycles. However, most vehicles could not pass this way because the riverbanks were steep and very muddy. While this made every day travel more cumbersome, it also meant that referring patients, especially in emergency situations, became especially challenging and potentially dangerous because of the added time delay.

At the time of my research, the staff at the health center included a physician's assistant, midwives, enrolled nurses, community health nurses, health assistants, laboratory staff, and a psychiatry nurse. The physician's assistant is the in-charge for the facility. The staff fluctuated, with some staff being transferred to other clinics or hospitals, but they were typically replaced by another person of the same rank. A list of the staff's pseudonyms, their role at the facility, and their genders can be found in Appendix 1.

[8] Tiisi is a pseudonym, as are all names of individual participants.

The Facility

The health center has an out-patient department (OPD) with an intake and waiting area, and OPD ward where patients are seen for nearly every condition besides pregnancy. This side of the clinic also has the small laboratory and dispensary. The other half of the clinic is devoted to reproductive health, with an antenatal care ward, a family planning room, and a labor ward. Though there technically is a room devoted to family planning, where contraceptives are indeed dispersed or injected, this room also houses the computer where a nurse uploads health insurance documentation monthly. The labor ward has two rooms: the lying-in ward for women in labor and post-delivery, and the labor ward itself where deliveries are conducted.

For record keeping for antenatal care, pregnant women are given small booklets, also called antenatal cards, at their first appointments. These booklets not only hold patient information, but also provide educational information for the women, if they are literate. Midwives use large 11x17 inch notebooks called "registers" in which they record the same information from the antenatal card as well as contact information and health insurance number for each client.

Below are photos (Figure 3.6 – Figure 3.11) of the various rooms within the maternity ward of the health center. Figures 3.6 and 3.7 are of the antenatal care ward, Figures 3.8 and 3.9 are the labor ward, and Figures 3.10 and 3.11 are the lying-in ward. Each ward is a single room. It is not unusual to have two women laboring at the same time, and both stay in the lying-in ward during labor. Rarely are two women ready to deliver at the exact same time; however, should that happen, there

is another delivery bed in the labor ward which typically holds other things but can be used if the need arises.

Figure 3.6 (Left): The midwife's desk in the antenatal care ward.
Figure 3.7 (Right): The examination table with Pinard horn resting on it, is against the wall in the antenatal care ward. The chair in the photo is where clients sit after being examined on the table.

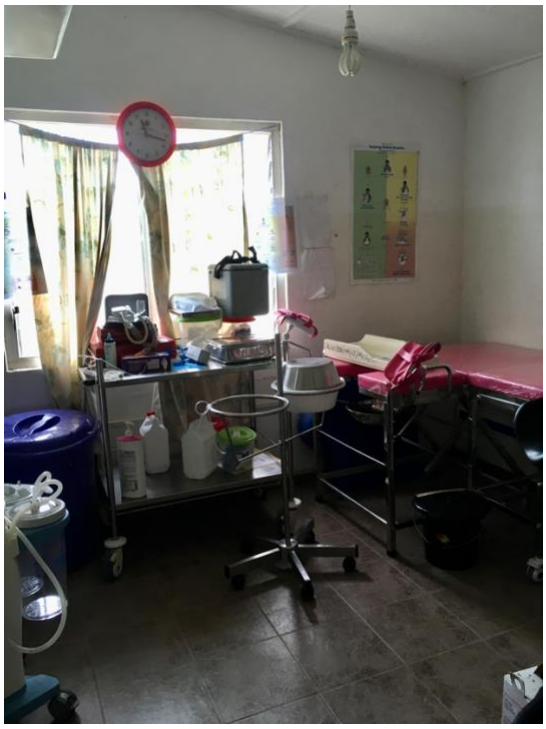



Figure 3.8: (Left) The delivery table in the labor ward.
Figure 3.9: (Right) The other side of the labor ward where supplies and tools are kept and the second bed can be seen in the back corner.


Figure 3.10 (Left): One of the two beds in the lying-in ward, and the blood pressure machine.
Figure 3.11 (Right): The other bed in the lying-in ward.

The Midwives

"Sandra" is a 30-year-old woman who grew up in Bolgatanga. She chose to do her midwifery training in southern Ghana because she "wanted to experience something different." She speaks Twi, the common language in southern Ghana, adequately, which was useful when the occasional Twi-speaking client came into the clinic. She finished her midwifery training in 2017 and was the "junior" of the two midwives.

"Vivian" is 32 years old and is from Bongo. When I began my research, she had two daughters, aged 8 and 6, and was pregnant with her third child. She gave birth to her third daughter in December, 2018. She originally trained as a CHO and worked at a CHPS compound for several years before she was transferred to the Bongo District Health Assembly's public health office. She was in charge of collecting and correlating data from all clinics in the district. When she was pregnant with her second child, she decided that she would go to midwifery school after she delivered. "Me and Sweetie did the training together" she told me, meaning she was able to bring her infant daughter with her as she completed her midwifery course. Once she earned her new degree, she was posted to Tiisi Health Center. Her husband lives with the children in Bongo, and he brings the girls to Tiisi during holidays. Both women are Gurune and are Christians who attend church weekly.

"Esther" arrived at Tiisi in January 2019 as a temporary replacement for Vivian while she was on maternity leave. Sandra and Esther did part of their training together at Bongo Hospital and were familiar and friendly with each other. Esther has two children, one of whom was 13 months old when they arrived and was still

breastfeeding, therefore he accompanied her to Tiisi while her older son stayed with his father in Bolgatanga. Her son is extremely active and was a nearly constant distraction for his mother and the other health center staff, as well as the clients as he ran around the clinic while his mother worked.

Figure 3.12: Two midwives reviewing the ultrasound screen with a client.

Ethnographic Vignette – A typical day in the antenatal care ward

Much of a midwife's work in the Ghana Health Service system is routine antenatal care (ANC), rather than delivery or emergency cases. For every delivery they conducted, the midwives at Tiisi attended to at least ten antenatal appointments. Much of my time with the midwives was spent observing these ANC appointments, waiting for a delivery case or an emergency. Most were unremarkable. The routine typically went like this: Alice, the nurse's assistant, would

be in the waiting room starting around 9:00 AM, taking the weight and blood pressure metrics of patients as they trickled in, recording their data in their maternal health records books. When the midwife was ready, she would shout, “next person!” from behind the curtain hanging across the ANC room’s doorframe.

Women come in one by one, remove their shoes, clamber onto the examining table, and draw up their dresses to around their breasts, exposing their bellies. The midwife will first take a tape measure to record the fundal height, which means to measure the distance from the pubic bone to the top of the uterus. The distance in centimeters roughly correlates to the number of weeks the woman is pregnant; that is, if a woman is 30 weeks pregnant, she should measure close to 30 cm (of course, this is not accurate for twin pregnancies or fetuses that are not growing normally). Then, the midwife listens for the fetal heartbeat with either the Pinard horn or an electronic fetal heartbeat doppler. The fundal height and fetal heartbeat are recorded in the health record book, then the midwife stacks them on her desk and sends the women back to the waiting room.

After everyone has been measured, she picks up the books and calls them back in by name. At this time, if the clients need the malaria preventative drug sulphadoxine-pyrimethamine, called SP for short, HIV or syphilis tests, tetanus shots, and refills of folic acid and fersolate pills, they will receive it[9]. The clients mostly sit

[9] Women are given tetanus shots when they register a new pregnancy unless it has been recorded that they have received at least five doses prior. This is to protect the baby against neonatal tetanus. Fersolate is ferrous sulphate, an essential mineral used to help treat iron deficiency anemia. Folic acid is given to help with fetal growth and to prevent spina bifida. These vaccines, drugs and tests are provided assuming they are in stock. Syphilis tests were out of stock nearly the entire time I was at Tiisi. Additionally, there were near constant shortages of folic acid and fersolate, so the midwives would buy these drugs from a pharmacy in Bolgatanga and sell them to clients, though they should be provided from GHS for free.

quietly in the chair facing the midwife, watching her record the data from their maternal health records into the large register that is open across the desk. The midwife asks how the client is feeling and answers questions they may have. She also checks their health insurance at this time and if they are expired or nearing expiry, she writes a note on a prescription pad stating "pregnancy confirmed" and stamps it so that they can renew their health insurance for free, thanks to a provision within the National Health Insurance Administration for pregnant women.

Cost of Care

In 2008, a new policy was put in place within the National Health Insurance Scheme (NHIS) which stipulated all maternal health would be free. This included free registration with the NHIS, free services throughout pregnancy, childbirth, and for three months postpartum (Dalinjong et al., 2018). This policy was implemented to help Ghana achieve the MDGs related to maternal health, in the hopes that free care throughout pregnancy, delivery, and postpartum would increase utilization of biomedical services. However, Dalinjong et al. (2018) found that while services are free, women still face numerous out of pocket expenses, including transportation to get to the facility, payments for drugs and laboratory services, payments for ultrasound scans, and for items needed during delivery. My research also confirmed women were expected to pay for all of these things. For women attending antenatal care at Tiisi, an ultrasound scan typically cost the equivalent of $2 USD, and the routine drugs of folic acid and fersolate were supposed to be provided by GHS for free, but stockouts required the midwives to buy it from pharmacies and then charge clients a $1 USD out of pocket fee. These drugs were given for free to clients

who could not afford to pay, and scans were performed for free at Tiisi Health Center for diagnostic purposes when the health of the fetus was in question. If a woman arrived at the facility without bringing her required things (a plastic sheet, yards of cloth to wrap mother and baby in, old cloths to be used to clean up blood, and soap, among other things), they would be charged for these things, which could be as much as $6 USD.

The Cultural Context of Obstetric Care Seeking in Ghana

There is a great deal of literature from Ghana on 'gatekeeping,' or intra-familial decision-making, particularly in regard to accessing obstetric care. The northern areas of Ghana are highly patriarchal and patrilocal societies in which women traditionally move into their husband's family compound after marriage, and it is typical for two or more, often related, nuclear families to live together in a compound, which is headed by a senior male (Ngom, 2003). Women often occupy a low status in the household hierarchy, and have little autonomy. However, in this area of Ghana, grandmothers (the mothers-in-law of the pregnant women) are considered a repository of knowledge on local medicine and maternal and child health (Gupta et al., 2015; Moyer et al., 2012; Aborigo et al., 2014; Cassiman, 2006). Younger women typically must seek permission from their husbands, mothers-in-law, or the head of their compound for pregnancy-related care, or any care at all (Ngom et al., 2003; Mills & Bertrand, 2005; Cassiman, 2006; Moyer et al., 2014a; Ganle et al., 2015; Gupta et al., 2015).

Even if it is just for routine antenatal care, the vast majority of women in the Upper East Region report that it is either their husband, their mother-in-law, or their

husband and mother-in-law together that made the final decision the last time she needed ante- or post-natal care (Ganle et al., 2015). Grandmothers assess the risk of a situation and make the ultimate decisions regarding the severity of an illness, where and when care will be sought, and whether a woman will deliver at home or in a clinic. Additionally, it is almost always the mother-in-law who accompanies a woman to the clinic when she is ready to deliver, rather than the husband or someone from the woman's own family.

Decision-making regarding which type of care to seek has shifted over the last few decades. In a qualitative study in the Upper East Region, Moyer et al. (2014a) found agreement among all participants in acknowledging that delivering at the clinic is safer than delivering at home. They quote one grandmother who stated, "But for us in the olden days we will stay in the house and will be commanding the woman to push and all of a sudden you will see the woman is lying dead … So this is the reason why we have accepted the hospital for women to go and deliver there" (Moyer et al., 2014a: 113). However, this is not the case for everyone. Ganle et al. (2015) quote a lactating mother in a focus group who explained, "…when I was pregnant I did not go to hospital until it was 8 months. I wanted to go but my mother-in-law said I was ok. When it was time for me to give birth too, she said I should deliver at home. You know, my mother-in-law said she gave birth to all her children at home and never had problems. Because of her experience, she did not want me to go to the hospital" (p. 10).

In studies occurring in the Upper East Region, women reported 'official' obstetric risks such as pain, vomiting, headaches, prolonged labor, large fetus,

hemorrhage, anemia, umbilical cord wrapped around the baby's neck, retained placenta, and prolapsed uterus (Mills & Bertrand, 2005; Aborigo et al., 2014). Obstructed labor, premature delivery, and the umbilical cord wrapped around the baby's neck were all identified as antepartum and intrapartum risks in another study conducted in the region (Engmann et al., 2013). Women in Engmann et al.'s study (2013) agreed the umbilical cord could wrap around the neck if the mother changed positions too quickly, and the way to treat it is to tie a rope around her waist and untie it.

Though all these are 'official' risks, women also reported traditional beliefs for the causes of these conditions, such as the belief that extramarital affairs can lead to prolonged labor. Extramarital affairs with another member of the husband's clan are considered incest, with the husband's brother being the worst offense (Denham, 2017). The severity of the offense is correlated with the severity of the complications and prolonged labor. There were also traditional cures for these conditions, such as pouring hot water on the woman's abdomen to stop postpartum hemorrhage (Mills & Bertrand, 2005) or using herbs to stop vaginal bleeding (Aborigo et al., 2014).

As with the other literature on reproductive risk, scholars have found that women in Ghana fear both spiritual and non-spiritual forms of pregnancy risk (Dako-Gyeke et al., 2013; Bazzano et al. 2008). Similar to findings in other parts of Africa (Chapman, 2003; 2010), some Ghanaian women fear others gossiping about their pregnancy and potentially practicing witchcraft, which can result in miscarriage or other maternity complications (Bazzano et al., 2008; Dako-Gyeke et al., 2013).

Women are considered to be particularly at risk of witchcraft if they disclose their pregnancy early, go out at night, fight with others, or eat/drink certain foods (Dako-Gyeke et al., 2013).

Denham (2012) outlines several unofficial risks that conflict with the Ministry of Health's maternal health policies aimed at reducing maternal risk. Firstly, he found mothers were reluctant to visit health clinics after hours, not wanting to inconvenience the midwives. The official policy encourages mothers to access care no matter the hour, but Denham (2012) found this is not the case. Secondly, there is a common unofficial risk concern in this region: the fear of giving birth on a path or road. It is believed that children born on a path or road, which is a "liminal, ambiguous, and potentially dangerous place" will continue to inhibit a liminal space, somewhere between this world and another (Denham, 2012: 174). It is believed these children will never fully integrate into society and are sometimes considered "spirit children." Therefore, some believe it is safer to deliver at home than risk delivering while in route to a clinic.

Spirit children are believed to be 'sent from the bush' to cause misfortune (Denham, 2012; Engmann 2013; Denham, 2017). Spirit children are not only those who are born on a path or road, but also are typically deemed as such based on physical aberrations, such as a congenital disability, or children that are chronically ill. Spirit children are also identified in conjunction with an unfortunate event, such as the death of the mother during childbirth or shortly after. Spirit children are considered to be a threat to families and communities, and are often either shunned or killed. Denham (2012, 2017) found that while mothers are typically blamed for

many of the risks detailed above, they are not blamed for spirit children. A mother is not blamed when her child is born with cerebral palsy, for instance; rather, this condition is blamed on the spirit world.

A number of authors have written about GHS midwives maltreating their patients (Moyer et al., 2014b; Rominski et al., 2016; D'Ambruoso et al., 2005; Mills & Bertrand, 2005; Bazzano et al., 2008). Maltreatment spans a spectrum from midwives speaking harshly to patients all the way to physical abuse. In a study focusing on midwifery students, Rominski et al. (2016) found that the midwives justified their abusive care with reasons such as: being tired and overworked, as there are too many patients and not enough midwives; feeling disrespected by patients; and a belief that force is necessary to get mothers to cooperate in order to save their life or the life of their baby. Moyer et al. (2014b) found that women reported being hit, slapped, and kicked by midwives, and that such abuse is a driver for women wanting to deliver at home rather than a healthcare facility. Recently, this has been found to be a wider problem across West Africa and even in other places such as Myanmar (Bohren et al., 2019). Maltreatment by midwives at clinics can be seen as both a potential risk for mothers and a deterrent to accessing care.

Ethnographic Vignette – A Busy Day in the Maternity Ward

Ellen, a CHO who was temporarily posted to the maternity ward at Tiisi because she had a young infant daughter whom she would bring to work because she was breastfeeding, was counseling a couple about treatments for hepatitis B. Ernest, a CHO who stopped by Tiisi to pick up supplies for his CHPS compound, decided to stay and assist Ellen because she was the only one working in the

maternity ward that day. He was rustling through the stack of books and papers on the desk, trying to find the family planning record book to give a woman her Depo-Provera shot. Suddenly, Emmanuel and Dennis, an enrolled nurse and the psychiatric nurse who both regularly work at Tiisi, rushed into the room and said there was a pregnant woman having a seizure at a house in the community and that she was possibly in labor. Emmanuel stated he was going to check on her and would call to report back. At this point, Ellen pulled out her phone, dialed Vivian, and said, "Auntie, where are you? There is fire on the mountain! A woman is in labor at the house and there is no midwife here. Like the time you delivered under a tree!" Vivian told her she was at a training in Bolga and to call Sandra instead.

There was a woman in the waiting room who was referred from OPD. She came in for treatment for candidiasis but a rapid pregnancy test revealed she was pregnant. She had been waiting for several hours, so Ernest pulled her into the ANC room and said that she shouldn't have to wait any longer. Ellen shook her head and told him, "I am not a midwife, I don't know which drugs are okay at which stages of pregnancy so we have to check with a midwife." Ellen called Sandra, who confirmed that the drugs Ernest wanted to give were fine and he sent the woman to the OPD to be discharged.

Emmanuel returned from the home visit with a woman on the back of his motorcycle. He led her into the labor ward, then came into the antenatal ward and asked Ellen to do an exam. Ellen said she could not (she in fact is not a trained midwife and would not know what to do). After a bit, Ellen went into the labor ward to check what was going on. She returned to the antenatal ward to call Sandra on

speaker phone and said, “we have the woman here but she is not allowing anyone to examine her or clean her.” Sandra chortled and said she didn’t know what to do. Alice, the midwife’s assistant, sat down on the bed next to me and said, “she lost the child.” Ellen replied, “this is the consequence of delivering at the house, you don’t get competent people.”

Not long after, Sandra rushed into the ward, in a flowing sundress that was a striking contrast from her usual nurses’ uniform. She said she just arrived from Tamale. She looked to be in good spirits but wasn’t thrilled about being called back after only having been on leave for a few days, as she had been visiting her boyfriend. She told everyone in the room that she had just been in the labor ward to check on the woman, whom she had found to be very distressed. Sandra had been in the clinic less than five minutes before someone came into the waiting room and shouted, “Emergency!” Sandra ran out to meet a man carrying an unconscious pregnant woman into the labor ward. Sandra, Ellen, and Janet, a CHO from the OPD, struggled to find a vein to get an IV in her arm while Emmanuel took her blood pressure. When they finally succeeded in finding a vein and had attached a bag of Ringers lactate[10], the woman stirred and woke up. Sandra asked questions while scanning her abdomen with the fetal doppler. She found a heartbeat. The man who brought her in said that the woman was at home when she just collapsed. Sandra did a rapid malaria test and tested her urine for protein. Both tests were negative, and once the IV bag was empty, the woman asked to go home. Sandra was unsure what

[10] A mixture of sodium chloride, sodium lactate, potassium chloride, and calcium chloride, essentially a rehydration solution.

caused the woman to collapse, but was convinced it was “pregnancy related.” However, unable to point to any definitive cause, she reluctantly let her go.

Summary

The Upper East Region is a remote, mainly rural region with a limited number of health facilities and qualified health staff, most notably of which is a severe lack of doctors in the area. Midwives operate in the GHS system as the obstetric experts in a context where their patients largely have to defer to others for permission to seek care, and they fear a variety of official and unofficial risks when doing so. Midwives work in conditions with limited resources and supplies, their posts are hard to reach, and the weather – be it the heat, the rain, or the *Harmattan* dust—is nearly always miserable. Their lives and work are very stressful, and at times can be overwhelming, potentially resulting in abuse of patients. A variety of cases come through the doors each day, and phones are regularly used by health professionals to communicate with one another regarding patient care. Given these conditions, and the fact that nurses are already using their phones to speak with one another regularly, telemedicine has been proposed as a way to help address the many challenges of providing maternal health care in this area.

Chapter Four
Telemedicine Projects in Ghana

This chapter details the evolution of telemedicine in Ghana over the past decade. After an overview of three projects or programs that occurred in the Upper East Region, I provide some results from my participant observation and unstructured interviews at Tiisi Health Center, as well as findings from the semi-structured interviews with Ghana Health Service (GHS) administrators involved in the current telemedicine program. Then, I utilize normalization process theory to analyze this implementation. Finally, I discuss new adaptations that have potential for broader success.

Part 1: Background on Telemedicine Projects in the Upper East Region

This section gives a brief overview of the eHealth projects that have been occurring in the region for the last decade to demonstrate how eHealth is evolving in the area.

MoTECH

In 2009, GHS partnered with Columbia University and the Grameen Foundation to launch a Bill and Melinda Gates Foundation-funded pilot project called "Mobile Technology for Community Health (MoTECH) Initiative" in the Kassena/Nankana West District of the Upper East Region. This project used cell phones in several different ways to try to increase client knowledge about pregnancy and delivery and to improve antenatal record-keeping. Pregnant women could register to receive weekly voice messages in the local language of their choice that

corresponded with the gestational age of their pregnancy (MacLeod et al., 2012). Nurses were to send data regarding patient registration, antenatal care visits, postnatal care visits, and delivery information to a central MoTECH system via their phones (which at that time were basic cell phones, not smart phones). Based on information submitted, nurses would receive weekly texts from the MoTECH system with information about clients who are overdue for services (MacLeod et al., 2012).

Some of the major challenges for this project were that many of the villages in the district did not have electricity, so both clients and nurses oftentimes did not have their phones on. Additionally, phones are often a shared resource in the households, and if the battery is low, men and senior women in the household are reluctant to give the phone to a young woman to wait for the phone message (MacLeod, 2012). The nurses also resisted uploading their patient data into the MoTECH system because it was extremely time consuming, especially since they were to do it through their basic phones (MacLeod et al., 2012). The implementors postulated that more training was needed, but also conceded the need for more research regarding the operational challenges and benefits for the nurses working at the periphery (MacLeod et al., 2012).

Climate Change in Health

The national telemedicine program currently being integrated into the GHS system is modeled after an UNDP-funded pilot project called "Climate Change in Health" which took place from 2012-2016. This pilot project occurred in three diverse districts: Bongo District in Upper East Region, Keta District in Volta Region, and Goma-West District in Central Region. The goal of that pilot project was to:

> Develop systems and response mechanisms to strengthen the integration of climate change risks into the health sector. [The] project actions will identify, implement, monitor, and evaluate adaptations to reduce likely future burdens of malaria, diarrhoeal diseases, and cerebrospinal meningitis (CSM), priority climate change-related health issues identified by national stakeholders (Climate Change in Health, 2015).

The premise of the project was that changes in the environment due to climate change have the potential to increase incidence of the diseases outlined in the quote above. While it was theoretically focused on climate change, in actuality, the project became mainly focused on the implementation of a telemedicine system to increase access to and delivery of healthcare for all conditions.

The project provided smartphones and prepaid phone credit to CHPS compounds and health centers to encourage communication between health workers, to increase outreach within communities, and to be used for over-the-phone consultation during emergency situations. The goal of the over-the-phone consultation was to decrease the number of referrals by telling the nurse how to treat a patient at her home facility rather than requiring the patient to reach the next level of care, or at least how to triage the situation so that the patient would be more stable by the time of referral. This was seen by program designers as a way to overcome barriers such as distance, lack of transportation, and the delay of administering treatment, all of which are dangers in emergency situations (Thaddeus & Maine, 1994).

Near the end of the project, the GHS created “Teleconsultation Centers” (TCCs) in each of the regions where the pilot projects were occurring, beginning with the Upper East Region. These TCCs were modeled after a TCC built in the Ashanti

Region through a telemedicine pilot project run by the Millennium Villages Project (MVP). Nurses who are trained in information and communication technology (ICT) are stationed at the TCCs to receive calls from healthcare professionals and either provide consultation themselves or connect the caller to the appropriate physician to provide the consultation. While the terminal level for the pilot project was at the district hospital, the TCCs are established in the regional hospitals to ensure the resources are available to all facilities in the region.

The National Ghana Health Service Telemedicine Program

When the pilot project officially ended in 2016, GHS agreed to partner with Novartis Foundation and MVP to begin the scale up implementation of the program with the ultimate plan of making teleconsultation available to the entire country. The scale up is more narrowly focused than the pilot project and only includes the over-the-phone consultation at the TCCs, and does not provide phones or phone credit to health care workers. The pilot project demonstrated that over-the-phone consultation is a potential way to not only overcome the geographic barriers, but also to build capacity of the nurses at the CHPS compounds by transferring knowledge downstream during the calls.

Many factors had to be taken into consideration for scaling up this pilot project – most notably, how to integrate it into the existing health system. A "national telemedicine team" is in charge of establishing the TCCs, training staff to run the TCC, and training the "regional telemedicine team." It was decided to build the TCCs at the regional hospitals so that every health facility in the region has access to it. It was presumed that callers would feel more comfortable calling the

regional hospital, rather than if the TCC were established in a district hospital, as people would not call a particular district hospital if they are located in another district. The regional hospital in Bolgatanga is centrally located and is the highest level of referral in the region. It is also physically located close to the administrative regional GHS building. Following the way in which the GHS is a decentralized system, the implementation plan of the telemedicine program is decentralized, meaning that once the national team has trained a regional team, it is up to each region to fund, further train downstream, and monitor and evaluate its own program.

The Current Study

My dissertation research plan was largely informed by a month-long visit to Ghana in 2016, during which administrators at several locations and in various roles told me that the UNDP-funded pilot project was very successful and was going to be scaled up to a national program. I visited the people in charge of the pilot project in the Ministry of Health, as well as the pilot project sites in the Upper East Region and in Volta Region. Informal discussions with people involved in implementing the pilot project at each of these locations told me that it was particularly successful in reducing maternal mortality, though they admitted they couldn't prove the correlation between reduced maternal deaths and the project. Additionally, one informant stated that the project has essentially increased the authority of those working at the CHPS compounds, because while the CHOs are often considered "small boys" or "small girls" who are young and fresh out of school, the fact that they are able to speak directly with a doctor on the phone gives them higher esteem among clients.

This idea that the ability to access a doctor via telemedicine, if necessary, would give a CHO or nurse stationed at a CHPS compound more legitimacy in the eyes of the community members was the initial impetus of my research. Therefore, I arrived in Bongo District to examine the assumption that community members' awareness of nurses or midwives' access to telemedicine would influence decision-making about seeking biomedical care, and when care is sought. In the first several months of my time at the Tiisi Health Center, I focused on the pilot project in the district, and comparing the pilot project to the scaled up national program at the TCC. The results are detailed in the next section.

Part 2: Utilization of Telemedicine Projects in Bongo District

This section draws from participant observation and interviews at Tiisi Health Center to give an overview of the sentiment regarding the UNDP-funded pilot project and national telemedicine program, which then prompted the interviews with the administrators implementing the scale up of the program.

Perceptions of the Pilot Project

Tiisi Health Center, as well as all the CHPS compounds within the subdistrict, participated in the UNDP pilot project. Staff at the health center explained how the pilot project worked: each health facility (the various health centers and the CHPs compounds in the district) was given a designated cell phone that was preloaded with phone credit (a bundle of call minutes and data), which was automatically

replenished monthly, to be used for over-the-phone consultation. When asked about the pilot project, Aisha, the in-charge at Tiisi, told me,

It was very beautiful.

She explained that the CHPS compounds and even community volunteers would call her if they had a labor case or something they felt they could not handle themselves, and she would either tell the CHOs what to do over the phone or tell them to bring the patient to Tiisi Health Center. In a similar fashion, when Tiisi Health Center had a case that needed the next level of care, they would call the medical superintendent at Bongo Hospital. Aisha stated that the medical superintendent would also call them to check in and discuss patients. The pilot project required that each health facility keep track of all consultations and calls via a log book, which she still had and showed to me.

Others had very positive feedback about the program as well. Ernest, a CHO visiting Tiisi Health Center from a nearby CHPS compound, explained:

> *Patients, volunteers, community members could all call me if they needed something or to tell me about someone who was in labor or had a snake bite or something. And me too, I had a list of all the contacts of my colleagues and where they are posted on the wall in the clinic and I could call them if I needed to. . . . [A] colleague would call to discuss something small, like not something to bother the doctor about but something you need to discuss with a colleague to know what to do. For example, someone might call me and say 'I have a patient who came 2 weeks late for Depo[11] but it is too soon for a pregnancy test, so what do I do?'*

He also stated,

> *it [the pilot project] was good because you could call the doctor at any time. One time I sent a pregnant woman to Bongo and it was very*

[11] Referring to Depo-Provera, the injectable contraceptive

> *good because the doctor and the midwives were calling with regular updates.*

However, Ernest was frustrated with the way the project ended:

> *When that program ended, they didn't inform us. When a program just ends like that with no warning and then they say there will be a new one, we don't trust it because they're not serious.*

Transitioning to Using the Teleconsultation Center

There was a general dislike among the staff at Tiisi for the new GHS-implemented telemedicine program and TCC at the regional hospital. Aisha explained that when the transition was made to the national program from the pilot project, the call center wasn't actually up and running for some time. This created a habit of not using it. Early on in my fieldwork, when I first told her of my interest in the telemedicine program, Aisha stated that months would sometimes pass and they would not make any calls to the TCC. However, on my first day at the clinic, a young woman told the OPD nurse that she was pregnant and had fallen from her bicycle onto her abdomen and was now experiencing abdominal pain. Knowing that I was interested in the telemedicine system, Aisha told me that they were going to refer her and to come and observe. The phone numbers for the TCC were posted on the wall of the antenatal care ward and Sandra dialed each of them, but had no success getting through. She tried each of the four numbers twice before resorting to the standard way of reporting a referral: calling the Bongo District Hospital Labor Ward. I later discovered that the numbers on the wall (which were provided by the regional GHS administrative office) were incorrect and that was why they did not go through to the TCC. Months later, while assisting Vivian with antenatal appointments in a

small nearby community, I noticed that the CHPS compound also had the incorrect numbers pasted on the wall.

When asked if the TCC was not unlike calling Bongo Hospital in that you still could speak to a doctor, Ernest responded,

> *Bolga[12] is not in the normal line of referral so why would I call? Normally my CHPs clinic calls Tiisi and Tiisi calls Bongo. It's only if Tiisi or Bongo say, 'Don't waste time, go to Bolga' that we call Bolga.*

Aisha echoed this sentiment. She pondered the logic of the system by stating,

> *Why should we call all the way to Bolga if we are going to eventually refer to Bongo?*

In response to the suggestion that the TCC could provide useful information in situations during which the staff doesn't know what to do, and she stated,

> *We know the protocols. We go through the protocols ourselves, then, if we reach a problem, we call them and they ask us about each step of the protocol. We have done them, it just wastes time.*

The midwives also stated that they don't bother with consultation because they know when a patient needs to be referred to Bongo and it is vital to get a laboring or postpartum woman to the next level of care as soon as possible in an emergency situation. Vivian, the senior midwife, explained this to me by saying,

> *We know our limits. If we cannot handle here, we refer.*

Below is a story of an emergency situation that demonstrates how the staff know their limits, and what they do to handle the situation.

[12] Referring to Bolgatanga, the regional capital. See Figure 2.1 for visual depiction of what Ernest is describing here.

Ethnographic Vignette – Postpartum Hemorrhage

In a setting like a maternity ward, there is always an abstract "risk" lurking around. Even on a quiet afternoon, when the waiting room is empty and the midwives are lounging on the old hospital bed underneath the wide-open louvre windows, hoping to catch a breeze, there is always a chance that someone can come into the clinic at any moment with an obstetric case. Risk factors, official and unofficial, are ever-present and begrudgingly accepted as a fact of life, especially in a setting such as this. But what happens when the risks are realized and transition from risk to emergency?

There was a woman lying on the bed in the ANC ward when I came in. Sandra had conducted three deliveries the previous night and the labor ward was full, so the woman quietly let herself into the ANC ward around 4:00 AM and laid down on the worn-out mattress against the back wall. Sandra was busy discharging the newly delivered mothers when I arrived, so I started to fill in the stack of insurance forms in order to be useful. While I did paperwork, the woman, "Talata," stood up and began moving around the room, pacing, stretching, leaning over the examination table and swaying her hips back and forth. Though clearly in labor and experiencing frequent contractions, she remained silent.

Eventually Sandra came in and spoke with her. She hadn't even realized Talata was there until now, and she took her into the labor ward to do a vaginal exam. She returned shortly afterwards to tell me that Talata was 8 cm dilated and she was going to go prep the tools for the delivery. I asked if she would deliver soon and Sandra said, "two hours, maybe." After 30 minutes, she hadn't returned, so I

went into the labor ward to see what was happening. When I stepped in the room, Sandra said, “She’s delivered!” I remarked, “That was fast!” and Sandra explained that immediately after she ruptured the membranes, “the baby just came like that. The way I like these kinds of deliveries!” Sandra finished cleaning Talata and weighed the baby. I asked if she had torn during the delivery and Sandra said there was a laceration but it wasn’t bleeding so she wouldn’t suture it.

Sandra got the mother settled into the lying-in ward with her baby and she asked me to remain in the room to take the ANC clients’ blood pressure readings, as Alice did not come to work that day. Women trickled in one by one and I recorded their blood pressure and weight in their record books. Talata watched as I did this, sometimes talking to the other women. They would stay for a minute or two after their measurements had been recorded to coo over the new baby and congratulate the new mother. Talata was tired, but happy and remained alert. After the last antenatal client left the room, she stood up to readjust her bedsheets. As she did so, blood splashed onto the floor. I quickly grabbed her a new pad and cleaned the floor with bleach and the mop. She changed her pad and sat back down while I went into the antenatal ward to inform Sandra. She acknowledged the information with a nod and continued with the ANC exams.

Shortly afterwards, Talata called for Sandra and said her buttocks was hurting. Sandra said this was odd; if it had been abdominal pain, she wouldn’t think much of it, but this was unusual. Sandra went to examine her, and after about 20 minutes and I again went back to the labor ward to see what was happening. As I pulled the curtain aside to step into the room, I encountered a very bloody scene.

There was blood spattered all over Talata's legs, all over Sandra, and all over the floor, even some on the wall. I asked Sandra what happened and she said the woman had a hematoma that had burst. When Sandra removed the pad that was packed inside Talata's vagina, more blood came gushing out. She told me to cut another pad in half and I had to search for scissors. Along the way, I ran into Aisha and told her that the woman who delivered was now bleeding and she followed me back into the labor ward. The next hour and a half were spent triaging.

As Sandra tried to stem the blood flow between Talata's legs, Aisha worked to set up IV lines in both of her arms and put normal saline on each. Sandra found Cytotec and put it under Talata's tongue and in her anus. Then she called the Bongo Hospital Labor Ward and said she as referring on account of postpartum hemorrhage and that she needed a car. Sandra then got the HB machine and tested the hemoglobin level, which was 10.7 g/dl. She and Aisha took turns talking to Talata, slapping her arms and yelling her name to keep her awake. Sandra would regularly swap out the pads and gauze in the vagina for fresh ones when they became saturated with blood. Every time she removed the cotton, fresh blood would gush rapidly onto the floor. After thirty minutes, Aisha measured the HB again and it was 9.3 g/dl. Her rapid drop in hemoglobin levels was an indication of how much blood she was losing, and she was rapidly becoming more and more anemic.

Forty-five minutes after Sandra's first call, Aisha's phone rang and the person on the other end asked if they needed a car from Bongo. Aisha said "Yes! Fast fast, it's an emergency!" Now on speaker phone, they asked if the hospital had been informed and Sandra yelled from across the room, "Yes, they know, don't stop to

pick a midwife, I will go with her!" Sandra then left the room and Aisha and I stayed with Talata, talking to her trying to keep her awake. Looking fearful, she began speaking rapidly to Aisha, who turned to me and said, "she's saying that there are people in the room watching her." I asked if she meant that she wanted me to leave the room and Aisha said, "no, she's hallucinating, seeing people who aren't here. She is seeing ghosts." Aisha then began telling the ghosts, "Not today!" and to leave.

Aisha told Talata's mother-in-law to bring in the newborn in the hopes that the baby would motivate the woman to stay awake. By this point, the she was in and out of consciousness due to the large amount of blood lost. Finally, we heard the truck pull up and two nurses, Eric and Richard, clumsily tried to get the stretcher into the Labor Ward. They stood awkwardly by the bed, discussing how to get the barely conscious woman onto the stretcher when Sandra said it wasn't going to work and they were wasting time. She shoved the two bags of saline and the catheter bag into my hands and said that we would have to carry the woman out of the room. Talata tried to stand up but immediately fainted. Sandra somehow caught her in her arms before she hit the ground, then stood up with an unconscious woman in her arms. She looked at me and yelled, "GO!"

As I stepped back, I felt my foot slip in the blood that had pooled in my sandal. We slowly and awkwardly navigated the two turns through doorways to get into the larger OPD waiting room, where Sandra laid the woman on the nearest bed. The IV lines had come unattached and one was quickly put back in before wheeling her down the ramp to the truck. There was a struggle to get her off the bed and into the truck and then Sandra started yelling that they needed the card. I ran back into

the labor ward and grabbed her maternal health recorded, which had her insurance card and referral slip inside, and ran back out and handed it to Sandra, then the truck took off.

That evening, Sandra called me and said that Talata was now stable. She explained that when they arrived at the hospital, the medical superintendent chastised Sandra, saying she could have handled this at Tiisi. “But then when he removed the pad, the way the blood just started flowing, he said ‘Ah!’” He recanted his statements about Sandra handling the case at Tiisi and told her that this was a good experience for her but it was also good that she brought the patient. It became clear that the laceration Sandra had seen but not stitched did not bleed because it was being plugged by the hematoma. As the hematoma acted as a stopper, blood began to pool inside her body. Eventually, the pressure that built up from the internal bleeding caused the pain in the buttocks that caused her to alert Sandra. After several attempts at suturing, the medical superintendent at Bongo was able to stop the bleeding and Talata fully recovered.

The case demonstrates the inherently risky nature of birth. Shortly after the birth, Sandra was pleased with how easy the delivery was to conduct. However, there is always a risk of hemorrhage. Talata was lucky; she was still at a facility with a midwife when she started bleeding. Sandra immediately knew this was a case of postpartum hemorrhage and how to handle it. She had Aisha, a physician’s assistant and the highest-ranking staff member at Tiisi assisting her. They followed the protocols for this type of case, which included giving Cytotec and to refer the patient to the next level of care. While many obstetric cases wind up going to Bongo by

motorcycle, a case such as this needs a real vehicle. Of course, an ambulance would be ideal, but there are only a handful in the region and it would have taken hours for one to arrive.

In this case, there was not time for teleconsultation, nor a need for it. As Aisha is quoted as saying above, she and Sandra knew their protocols and they followed them. Without seeing the patient in person, the medical superintendent would not have been able to direct Sandra on how to suture to stop the blood flow. And with both of their hands full trying to triage the situation, Sandra and Aisha barely had time to remove their gloves call to the district about the car they requested. Though it was mid-afternoon, it was still difficult for them to get a car to come quickly.

Referrals

When I spoke with the health center staff about the TCC, they often mentioned it as being 'for referrals' in their responses. This was an interesting interpretation of what the TCC was to be used for, as the actual goal of the program was intended to be over-the-phone consultation in order to avoid referring a patient. This was the first indication that staff had not been trained adequately on what the TCC is and how to use it. Eventually, a nurse explained that they only use it to report that they are referring a case. However, as they almost always refer to Bongo District Hospital, not the regional hospital, they see the call to the TCC as repetitive and unnecessary.

I observed dozens of referrals during my time at Tiisi. Sometimes, the clinic staff would call ahead to Bongo District Hospital to let them know a patient is on the

way, but not always. It was not uncommon for clients to say they want to go home and “prepare” before they go to Bongo for the referral. Sometimes this was allowed, and sometimes it was not. Typically, when a person is referred to Bongo, they must find their own way of transport (usually a motorcycle ride provided by a family member). Hiring a taxi to take a patient from Tiisi to the hospital is an expense many of the small-scale farmers in the area cannot afford. The clinic has the motorking ambulance (See Figure 1.1), but rarely use it because it is slow, uncomfortable, the driver is not always available, and in the rainy season, the muddy roads can be impassable for that type of vehicle. On rare occasions, the district health assembly (DHA) will send a truck to pick up a patient, but this only happens when a high-risk patient needs to be transported quickly, such as when a laboring woman needs to deliver at Bongo rather than Tiisi.

These experiences and perceptions of using (and not using) the telemedicine program conflicted with my understanding of how the system is intended to work based on my conversations with those in charge of the pilot project in 2016. The fact that Tiisi Health Center was not using the program regularly meant that knowledge of nurses’ ability to access the program was not influencing decisions about utilizing the clinic because the staff were not using it and clients were not aware of its existence. This is especially noteworthy, given the enthusiasm for the pilot project. To investigate this apparent disconnect between how the administrators of the pilot project described the experiences of the end users, and the experiences of the staff at Tiisi Health Center and within the sub-district, I interviewed staff members of the

GHS at each administrative level (national, regional, and district) who were involved with the telemedicine program.

Part 3: Implementation of the National Telemedicine Program

Interviews were conducted with 13 administrators directly overseeing the implementation of the telemedicine program in order to determine 1) to what extent the program is being delivered as planned to the intended targets, 2) what barriers are constricting the scale up and 3) what facilitators are making it successful. Interview topics included the structure of the program and how the implementation was carried out, the goals of the program, its strengths and weaknesses, the various resources available to support the program, comparisons of the program to the previous UNDP pilot project, details of how trainings are carried out, and descriptions of how the program is monitored and evaluated for consistency to the program model. The following is a discussion of the prominent themes that arose from discussions with administrators at the national, regional, and district levels of GHS about the implementation and scale up of the national telemedicine system.

Training Health Workers to Use the Telemedicine Program

The national and regional telemedicine team members explained that the telemedicine program model is a decentralized system. The decentralization of the telemedicine program is clearly reflected in how trainings are carried out. In order to ensure consistency across all trainings, the national telemedicine team developed standardized tools, including a training manual. Trainings were conducted using a

downstream “training-of-trainers (ToT)” model. The national telemedicine team trains each of the regional telemedicine teams and the TCC managers. The regional team is then charged with training representatives from each district. Five representatives from each district attend this training, including administrative and clinical staff. Funding is provided by Novartis Foundation for these first two levels of training, but not for further training downstream. GHS is supposed to provide funding for training of the healthcare staff, but they did not provide any at the time of this study. The district representatives trained by the regional team are then supposed to conduct trainings in their district. Though there is flexibility in how to conduct this training, they often follow the model of training representatives, typically two from each health facility, who are then expected to return to their workplaces and train their colleagues (see Figure 4.1).

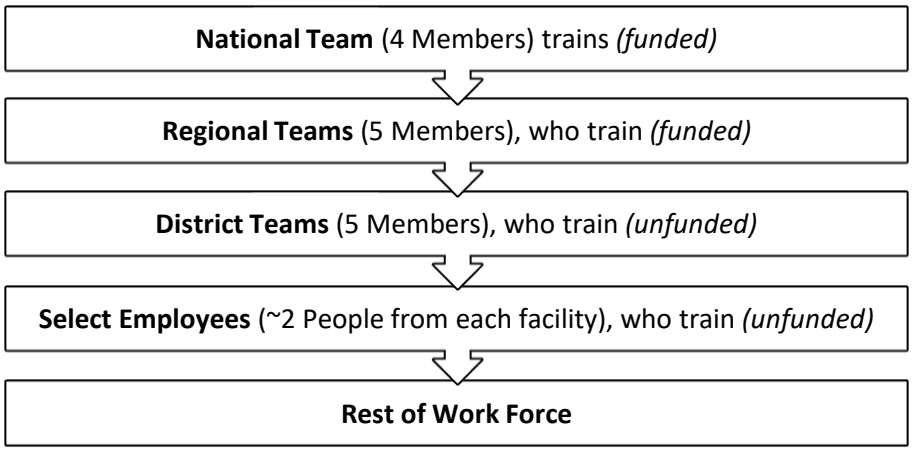


Figure 4.1: Downstream training model for telemedicine program.

This model of downstream trainings in which the lower levels (those responsible for training the end users) are not funded resulted in trainings simply not being conducted, or being conducted poorly. Two of the three districts visited stated they had not scheduled any telemedicine-specific trainings due to lack of

funding. Knowing that funding was an issue, the regional team suggested short-cuts for the district leaders, as exemplified below:

> *Because we are not able to provide direct financial support for downstream training, we encourage the district directors and the medical superintendents to [rely] on other programs. For example, if there is a district training on TB, Malaria, you can find one hour or so during that training to talk about telemedicine and these basic concepts. So, the scope of the training reduces as you go down the service delivery levels because you cannot expect one hour to cover to be able to cover the essential elements of telemedicine. But . . . that has been the encouragement that the districts and the hospitals should conduct a downstream training for their staff. [Participant 13, Regional Level].*

When training on the telemedicine program is tacked onto other meetings and not held as two-day, discrete trainings, the pre-and post-test surveys prescribed by the national team in the training manual are not collected and therefore there are no data available to evaluate these trainings. Additionally, the training manual does not intend for the "scope of training to reduce as you go down the service delivery levels" because the utilizers need to have a clear understanding of the program in order to use it effectively.

Staffing Issues at the TCC

A lack of responsiveness from the TCC created a feeling of futility for the target utilizers. Participants at the district and regional levels agreed that a major factor regarding the underutilization of the program was that calls placed to the TCC were not being answered. For example, a participant explained,

> *Those who have really called there gave their experiences that they called and their call was not picked, particularly at night. So, because of that, they decide to abandon the calls [Participant 6, District Level].*

A clinical practitioner explained,

> *The impression has been formed, so they have to work hard to correct that. Because people don't want to call because they have a lot of experiences of not picking, their calls not being picked. So now that they are there, people assume they are not there [Participant 11, District Level].*

Unanswered calls were largely due to the fact that until mid-2018, there was only one staff member assigned to the TCC. A frustrated regional-level administrator lamented:

> *I still need more staff! The staff that I have is not enough. Telemedicine should take no less than 15 staff to run it effectively and we are so few so we have our frustrations, we still run long hours. We should have at least 15 so we can do our normal 8 hours. We still do more, we stretch. [Participant 10, Regional Level].*

Another regional-level administrator agreed by stating,

> *So one of the weaknesses has to do with the number of staff. Though it is now four, I think we can do better. [Participant 14, Regional Level].*

Conflation of telemedicine program with regular referral practices

Lack of training, or insufficient training, created confusion between the telemedicine program and the regular referral system. Interviews from Tiisi and the district level participants illuminated that many health care workers do not use the program because it does not make logical sense to them. Another district director stated,

> *Usage of the service is very low in the district because of where they are … we have numbers … to call the teleconsultation center when the need be. And this is not all that done, because in my case, we refer to the [large District] Hospital. [Participant 6, District Level].*

In the quote above, along with quotes from Aisha and Ernest earlier, the respondents are stating that calling the regional hospital does not make sense if the patient is ultimately going to be referred to a district hospital and not the regional

hospital. Calling the TCC is viewed essentially as a way to report a referral. However, the stated goal of teleconsultation is to avoid that referral altogether. Part of the confusion is that GHS protocols stipulate that when a case is beyond the capacity of a particular facility, the patient should be transferred to the next level of care. Calling the TCC, which is housed at the regional hospital, oversteps the district hospital, which many practitioners are hesitant to do, and feels like a *"waste of time,"* as Aisha said, because the patient will very likely be referred to the district hospital, not the regional hospital.

Data regarding calls received at the TCC in Bolgatanga shed some light on why there is confusion as to how calling the TCC is different than making a referral. For the month of October, 2018, of the 16 calls received, all were told to refer the patient to the next level of care – which for the majority of cases, 10 out of 16, was the regional hospital, as Nabdam District does not have a district hospital – and none of them were connected to a doctor for consultation. These data show that few calls come in (or, few calls are answered), and that none of the callers are receiving over-the-phone consultation from doctors. Therefore, based on this sample, the goal of reducing referrals is not being met and capacity is likely not being built at the periphery (at least, according to this small data pool). Thus, at this point, the TCC does indeed seem to serve as a way to report a referral.

Monitoring and Evaluation

Of the three districts visited, only one had conducted trainings for all the health facilities and they stated that no one from the region or national team came to monitor their training. The other two districts had no plans to conduct their

training and no pressure or follow up from the region to ensure the trainings happen. Regional-level administrators admitted that a variety of other things also require their attention and they cannot always monitor the district-level trainings. No one at the regional level could provide a concrete number or documentation stating how many districts have completed their district-wide trainings.

When asked how they monitor and evaluate the implementation of the program, Participant 10 [Regional Level] explained,

> *[I]f the system is working well, . . . we expect that most referrals should reduce. Case management should improve, maternal death should reduce, under 5 mortality should also reduce. So these are all indicators we can use to monitor the effectiveness of the telemedicine in the region.*

Participants at the national and regional level stated that call data are the most valuable tool for evaluating the program. For example, an informant at the national level stated,

> *[W]e measure performance through the TCC reports, how the calls are increasing. And sometimes we go down to the TCCs ourselves and interview some of the clients and see the care. So those are the types of things we've done, but in terms of a full scale-evaluation, we haven't done it yet [Participant 5].*

In order to assess this, there is a

> *. . . team that goes every quarter to go and assess the calls received, what are the diagnoses, what are the forms that have been filled. So they look at their documentation and then try to see if they are doing well or not" [Participant 12, National Level].*

Regional administrators are also supposed to evaluate the call data regularly as well, but none of the informants interviewed could give a concrete number for how often those meetings happen. Participant 13 [Regional Level] explained,

> *Occasionally, from time to time, regularly, actually, we review the call statistics so we are able to tell where the calls are coming from, what are the predominant conditions with which the staff are calling to ask for help. . . . We do take advantage of other meetings because it's a new concept. We take advantage of other meetings and talk to heads of units, we review statistics for everybody's viewing and understanding.*

As is the case for the trainings, there is not dedicated time to focus exclusively on telemedicine, and review of the calls is simply tacked onto regularly scheduled meetings.

WhatsApp

WhatsApp emerged as an important facet of how the telemedicine system was actually being deployed. After the pilot project finished in Bongo District, it took some time before the TCC was up and running in Bolgatanga. In the meantime, a doctor at the District Hospital created a WhatsApp group for midwives to discuss maternal and child health cases. Recognizing the success of this informal telemedicine system, the regional administrators decided to replicate it and incorporate WhatsApp into the TCC system in September 2018, halfway through my fieldwork. A regional administrator explained:

> *Our innovation we are using is that we are adding the WhatsApp. … In every district, they have a WhatsApp group, what they use to manage cases. So what we did is that we are hooking the TCC center to the WhatsApp, the clinical WhatsApp groups in the various districts. So when the WhatsApp comes, like there is a case at a facility, they WhatsApp to the doctor "we have this child with this condition at our facility" it will pop up on the TCC so once the TCC sees it, what they will do is they will pick the phone and call the number and the facility staff will pick. So, in a way, they will stop the WhatsApping and they will engage them on the phone. So that is a different dimension of the implementation, though, the end result is that the call will definitely come through the TCC [Participant 14, Regional Level].*

Using WhatsApp platforms to discuss cases and patient information is a parallel system of telemedicine that the telemedicine teams want to integrate into their system. However, while the method described by Participant 14 is a logical way to integrate the two systems, in actuality it was not working very well. A district level administrator shared an example:

> *So when I see they put, they can put a post [on the WhatsApp platform to which the TCC is connected] around 12:00 PM, around three days no response, a very looong time. Then I have to call [the TCC manager] and say 'Hey, have you seen this?' and he will be telling me stories. [Participant 15, District Level].*

The TCC WhatsApp is succumbing to the same issues as the regular TCC: a lack of responsiveness makes the act of using it feel futile and frustrating for those who are attempting to use it. However, successful WhatsApp groups at the district level are an indication that the TCC WhatsApp has the potential to be successful, too. Districts are using WhatsApp platforms because health care staff are already familiar with WhatsApp and are using it in their daily lives. Adoption for work-related practices is therefore straightforward, and accepted because minimal pre-paid phone credit is charged to use WhatsApp. Additionally, photos can be shared via WhatsApp in addition to text, which can be useful in teleconsultation.

Communication between Levels of the Health System

There was a general lack of communication between the national, regional, and district levels of GHS regarding telemedicine. Due to the decentralization model, the only communication the national level receives from the districts and regions are reports regarding trainings conducted and utilization of the TCC. These data do not reflect the experiences of the users or explanations for low number of calls.

Additionally, there appeared to be discrepancies in the documentation for calls received at the TCC in Bolgatanga and the numbers reported to the national level. In September 2018, the national level introduced a new call encounter form that is to be filled out by the TCC staff during a call and also submitted as additional documentation to reduce such discrepancies.

Three additional staff members were added to the TCC in August 2018, but this was not communicated to the districts. Participant 3 at the District Level stated that her district did not receive any communication about the additional staff members. She stated that without communication, they do not know if the TCC is ready to receive calls and quipped,

> *Are they just sitting there bored collecting salaries? [Participant 3, District Level].*

She stated she would prefer more direct contact from the TCC, for example,

> *They should check in and say 'your district is not calling, is it because you don't have cases, or?' [Participant 3, District Level].*

Another district described a lack of communication from the TCC:

> *Like when you use the TCC Platform, the WhatsApp platform, initially, we get a feedback. They even tell you '[District] Public Health, follow up this,' and then they even give you the address and I take motorbike or I will call the CHO or the midwife around that [community]. … But for now, we don't get that feedback. And so it's difficult to tell when this case went, what happened. It becomes difficult. [Participant 15, District Level].*

When asked why communication during the pilot project was successful and why the national program has been less successful, a participant at the district level proposed,

> *If you are my friend and Mr. A is not my friend, if I am to call the two of you to assist me, I think I may call you [first]. If I don't get you,*

> *then I will call this person. If we are seeing each other almost every day, we are chatting almost every day, we are having meetings almost every day, that can make a difference. [Participant 11, District Level].*

Health care workers at the clinics in the periphery are generally familiar with staff at the district hospitals. As the district hospital was the terminal level for the pilot project, callers were receiving over-the-phone consultation from someone they knew. A lack of responsiveness at the TCC and lack of communication from the TCC and regional administrators are further deterrents from calling someone they do not know. Preference for communicating with a familiar person, or building rapport so there is trust during the over-the-phone consultation is an important element that should be considered when thinking about how to improve the TCC call experience.

Discussion

The major finding from the interviews with GHS administrators was that there was a disconnect between how the national-level telemedicine team thought the program was functioning and what was actually happening in the Upper East Region. Normalization process theory is a framework to analyze the implementation of new, complex programs in healthcare (Mishuris et al., 2019; May et al., 2009). It is a useful model to unpack the factors contributing to the disconnect between how the program is supposed to function and why it is not being utilized in the way that it is intended. The model's four domains help to organize the description of how implementation is operationalized. The four domains are:

1: *Sense-making/coherence*, which is the understanding of the new practice, both of how it differs from other programs, and of individual roles in new practice, and the value of the new practice.

2: *Participation*, which is the work of key personnel and relationships that drive change forward.

3: *Action,* the operational work necessarily to support a new practice. This includes the interactions between group members, individual and group accountability, skill building, and appropriate resource allocation.

4: *Monitoring* refers to the assessment work that is done to explain how a new practice affects the individual and group.

Sense-Making

Participants at the end-user level directly stated that the system did not make sense to them. This can largely be attributed to the lack of training and lack of communication from higher levels of GHS regarding how the program is supposed to be utilized. However, beyond just being trained on how to use the call center, the national telemedicine program is still at odds with other aspects of the GHS system. Below are brief discussions of hierarchy and referrals, both important ways in which the national telemedicine system does not "make sense" within the larger health system.

Importance of Hierarchy

Hierarchy, both within the clinic structure and within GHS, is very important and strictly adhered to by health care workers. The pilot project worked well

because every level of care was involved and there was a clear pattern of 'calling up the ladder' until you called the medical superintendent at the district hospital. This made logical sense within the culture of GHS so it was readily accepted and used. Though the TCC is theoretically similar to the pilot project in structure, calling the TCC which is housed at the regional hospital makes less sense at the community level because it is perceived to be jumping several steps of the hierarchy and is often not the place to which patients are referred, if need be.

Additionally, while a caller may eventually speak to a doctor, the call is first received by a nurse who follows a guided script asking the caller if they followed each of the steps of the protocol. As several of the Tiisi Health Center staff members explained, the staff know their protocols and feel it is a waste of time to go through them again when they are calling for information for how to handle a case once the protocols are exhausted. Moreover, as the person receiving the call is an enrolled nurse which is below the level of midwife, physician's assistant, or physician in the GHS hierarchy, I hypothesize that for this reason some practitioners are hesitant to use the system, because they are being asked to consult with a health professional with less training than themselves. While it makes logistical sense to house the TCCs at the regional hospitals, incorporating the district hospitals into the consultation system or making the TCCs independent of the regional hospitals could potentially increase usage.

Knowing Your Limits

A major reason the national system does not 'make sense' is that when all steps of a protocol have been taken and the patient is still in danger, protocols state

that a patient must be referred to the next level of care. This is inconsistent with the aim of the TCC, which is to have nurses call before referring. In an audit of obstetric referrals in the Upper East Region, Awoonor-Williams et al. (2015) found that in the vast majority of cases (nearly 70%), midwives refer patients because the guidelines say they should refer. Only in less than 10% of cases do the midwives refer because they lack confidence or are unsure of how to handle a situation (Awoonor-Williams et al., 2015). This aligns closely with my observations and illustrates another dissonance with the tele-consultation program: it is to be used when health care professionals are unsure of how to treat, but staff at Tiisi Health Center generally know how to handle most cases that present at the clinic and will refer if they don't know, or if the guidelines tell them they should. The standard way of doing things does not leave room for using the TCC. This dissonance could be lessened if the protocol included a step of calling the TCC for support prior to referring.

Participation

Of the three districts visited, only one was actively participating in the program. This was likely due to the fact that it 'made more sense' to them, as this district does not have a district hospital and they typically refer all patients to the regional hospital when referrals are necessary. This means that the issues of overstepping hierarchy facing other districts do not come into play. However, even this district struggled somewhat with the themes of the participation domain, which refers to the key personnel and relationships that drive change forward.

Relationships

Healthcare staff working within the GHS system know most other healthcare professionals within their districts through trainings and other social events. This was valuable feature of the pilot project, as everyone knew the people they were calling for consultation. There were already foundational relationships formed, which created trust between the participants on the phone call. This is an aspect that is missing with the national system, as people at the community level will likely not know the staff of the TCC. The quote from Participant 11 in which he states that it is natural to call the person you know before calling a person you don't is a clear example of why this is important. This is also seen in Ernest's example in which he explains how a fellow CHO called him to ask about what to do regarding the provision of Depo-Provera. This question is something someone might not feel comfortable calling the TCC about, but would feel comfortable calling a colleague/friend for advice.

Another aspect that is important to consider regarding relationships is the social nature of communication. Every culture has its own norms regarding communication, which are often replicated in phone calls. In Ghana, phone calls are extremely popular, and people call each other often. Greeting is of upmost importance in Ghanaian culture, and quick phone calls just to greet and ask about someone's family are very common. Phone etiquette and how to have a proper teleconsultation phone call are supposed to be covered in the training prescribed by the national team, although it is not known whether it is covered when the trainings are pared down. Not knowing the other person on the line at the TCC can keep

phone calls formal. However, this is a deviation from typical communication, which is often friendly, even for business calls in the workplace. Basic training on how to conduct a phone call to the TCC would establish expectations about proper teleconsultation phone etiquette.

The district built a tentative relationship with the Ministry of Health during the pilot project, which according to Ernest, was damaged in the way the program ended. A lack of communication regarding how the project would wind down and end was frustrating for those using it in Bongo District.

Action

This domain includes: the interactions between group members, individual and group accountability, skill building, and appropriate resource allocation. In essence, this domain focuses on the work that is being done and how it is getting done.

Interactions between group members

There is little interaction between levels of the GHS regarding the telemedicine program beyond the ToTs. Without interaction, relationships cannot be built, and no common bonds can be formed. This is a major barrier to the success of the program.

Accountability

Very little monitoring and evaluation of this implementation is occurring, which means there is little accountability. The decentralized nature of the program

structure means that the national level is not responsible for holding each region accountable. Rather, the regions must hold their districts accountable for implementation and utilization, but they are already also responsible for implementing many other national programs such as vaccination campaigns and find it hard to also monitor the telemedicine program. With no one at the national level holding them accountable, telemedicine falls down on the list of priorities.

Capacity Building

A major goal of the telemedicine program is to build capacity of the workforce at the lowest levels of GHS. At the time of these interviews, this was not happening, as evidenced by the call logs and conversations with those at the regional level who admitted that calls are not transferred to doctors. Capacity building regarding how to use the system is also not being built due to the poor roll out of the trainings.

Resource Allocation

Resources are key to the success of any program. There were not enough resources allocated for nurses to staff the TCC appropriately, for lower-level trainings, or for monitoring and evaluation. This, too, is a major barrier to successful implementation, and needs to be addressed within the GHS budget as Novartis Foundation wraps up their financial support.

Monitoring

The national telemedicine team at the time of these interviews had not yet conducted any formal monitoring of the program, which perhaps is why their perception of how the program was working was so incongruent with what was happening on the ground. Increased monitoring with increased accountability, which could potentially lead to ensuring that districts conduct the lower level trainings. This, of course, is dependent on more resource allocation.

Summary

From the beginning of the participant observation at Tiisi Health Center, it was clear that the telemedicine program was not being utilized. This was important first step in recognizing that the implementation of the new telemedicine system was not functioning as intended. However, the pilot project worked well in Bongo District, largely because it made sense and relationships were already there to ensure participation. This indicates that there is potential for telemedicine to work in this area if the system was redesigned. Additionally, it became apparent that a parallel telemedicine system was being utilized via WhatsApp. While the TCC's WhatsApp group was not very successful, the one for midwives in Bongo District was. The next chapter will focus on this technological adaptation.

In the vignette where Ellen had to manage a very busy maternity ward despite not being trained as a midwife, an informal version of telemedicine was used when the nurses and midwives were regularly calling each other to discuss patients. Ellen likely didn't even consider that what she was doing could be considered

telemedicine. She was just doing what was natural, which was to call those with authoritative knowledge for guidance. It worked to answer the question about which drugs and dosage were appropriate, but teleconsultation was less effective for harder questions like how to handle a client that was so distraught at losing her pregnancy she was unwilling to let anyone examine her. However, this example highlights the natural ways in which nurses communicate, which is an important contrast to the way in which the GHS telemedicine program wants nurses to communicate when they don't know what to do for a case.

Chapter Five
The Digital Labour Ward and the Rural Maternity Ward

This chapter describes the work of midwives in the GHS system, as well as the normal processes of social communication through multiple sources of data. In Part 1, findings from the Labour Ward WhatsApp platform are provided. In Part 2, further detail on the daily realities for midwives are described through the focus group data and participant observation at Tiisi Heath Center. These sources of data triangulate findings regarding work expectations, and how technology mediates communication to provide support or assistance for the midwives.

Part 1: The Digital Labour Ward – Teleconsultation Via WhatsApp

The "Labour Ward" is a group on WhatsApp that midwives in Bongo District are utilizing to receive and provide teleconsultation regarding obstetric care. WhatsApp is an app that allows users to send text messages, share photos and documents, send voice messages, and make phone and video calls. The app uses end-to-end encryption and uses data for all of its features, making it different from SMS text messages or standard phone calls, but similar to other apps like iMessage and FaceTime. WhatsApp requires a smartphone but is free to download and use. It was first developed in 2009 and was acquired by Facebook in 2014. WhatsApp is extremely popular worldwide, particularly in places where telecommunication companies do not provide contracts, but sell pre-paid phone credit instead. It is much more economical to send messages over WhatsApp than SMS because a message on WhatsApp uses very little data (therefore, costing very little), while an

SMS text can be relatively expensive[13]. Additionally, WhatsApp allows for "groups" that can have a large number of contacts, meaning WhatsApp can be much more interactive and social than a phone call or text message with only one person. WhatsApp allows two options for how people can join a group: either the creator of a group is the "admin" or "moderator" who has sole control of who is added, or the creator can choose to make others "admins" as well, who then can also add people to the group. No one can join a WhatsApp group freely; an admin must add the contact number in order for someone to join a new group.

After the Climate Change in Health pilot project ended, there was a void where there were previously structured lines of communication between the hospital and the facilities in the sub-districts. Recognizing that this was particularly an issue for obstetric cases, the medical superintendent at Bongo District Hospital, fondly referred to by all simply as "Doctor," created the "Labour Ward" group in April 2018. He added all of the midwives in the district that have WhatsApp to the group, also called "platform." This included both midwives who work in the hospital and midwives who work in the sub-districts at the CHPS compounds and health centers, as well as the administrative staff at the Bongo District Health Assembly (DHA) and the teleconsultation center (TCC) manager.

Essentially, this platform is intended to be used in much the same way that the TCC is supposed to be used: a midwife can turn to the platform when she is unsure of what to do, has a question about a case, or is reporting a referral.

[13] A single SMS message costs the equivalent of $0.10 per 150-character text using the large telecomm provider MTN in Ghana. A back and forth conversation on SMS can quickly deplete one's phone credit.

Returning to the idea of "sense-making" from the previous chapter, this system makes much more "sense" to the midwives than using the TCC for several reasons: 1) they are turning to other people with the same amount of training as themselves (or more training, in the case of the doctors on the platform), 2) they are following the hierarchy and normal line of referral when reporting referral cases to the next level of care at the district hospital, and 3) they are interacting with people they know and trust on the platform.

In Part 1 of this chapter, I examine how WhatsApp is being adopted and adapted in Bongo District for teleconsultation on obstetric care, using domestication of technology theory as a framework to understand this process. Then, I provide details regarding who is using the platform, how they are using it, and themes that arise on it.

Domestication of Technology

There are a variety of STS theories regarding the "domestication" of technology, that is, how technologies are adopted and adapted. Jeanette Pols (2012) theorized a particularly useful variation, which she calls "material semiotic elaboration of domestication theory." As discussed in Chapter One, material semiotics is the idea that humans and objects shape each other mutually (Pols, 2012). In Pols (2012) material semiotic elaboration of domestication theory, there are four steps in the domestication of technology process:

1. Technology is "unleashed" into daily life. How it will be actually used or how it will work can be unpredictable, and the technology can do "unexpected" things from what the developer intended. Pols (2012) gives the example of

the telephone: the telephone was invented to transmit formal communication, particularly for businessmen. It evolved to be a tool for everyday communication for everyone, and now, smartphones are technically telephones, but are capable of, and used for, so much more.

2. Technology is "tamed." In this stage, humans try to make the technology fit into the way they want to use them in practice. This is the stage where the technology is adapted from its original intention by its creators into a form that meets the needs of its utilizers. In the case of WhatsApp, it was originally created to be an app version of SMS messaging. After it was "unleashed," WhatsApp was adapted in the unexpected way, aka "tamed," to be used similarly to social media platforms in many countries, and now, as a vehicle for medical teleconsultation.
3. Technology sparks imagination and creativity. At this point, the technology may be tamed to perform a certain way, but people will think up new uses for it. Therefore, the technology will continue to be tamed in new ways. In the previous chapter, administrators at the regional level discussed how after seeing the adoption of WhatsApp in Bongo District for the Labour Ward platform, they decided to recreate this with a TCC WhatsApp group. Poor oversight has meant that the TCC WhatsApp group was not very successful, but this is an example of how people can be inspired by other examples of adaptations of technology to create new ones.
4. Technology tames the humans. Drawing from material semiotics, this point acknowledges that humans do not just influence the technology, but the

technology also influences humans. For instance, the way the technology was designed may limit the ways in which people can use it. Pols (2012) gives the simplistic example of a TV that only offers 10 channels limits how many channels someone can watch. Regarding teleconsultation, WhatsApp "tames" what the providers can do, mainly only allowing for text messages and photos to be posted. While there are features on WhatsApp that allow for phone and video calls, the network is not strong enough in rural Ghana to use these features. Additionally, while the cost of sending messages over WhatsApp is very little, a phone or video call uses much more data and is therefore more expensive.

The process of adopting and adapting a technology for a new purpose is an iterative one that requires the input of those utilizing it. In the next section, I provide examples of how WhatsApp is being used for teleconsultation and how members of the Labour Ward platform actively discuss how they think the tool should be used.

Usage of the Platform

This section will detail how the group actually works, how often it is being used, and what conversations are like on the platform.

Who is Using the Platform

From October 13, 2018 to November 9, 2019, there were 835 messages sent on the Labour Ward platform from 53 of the 68 members (78%) of the group. The number of times a participant has interacted with the platform ranges from 0 times to 179 posts, with a median of 5 posts. Doctor was the most common utilizer,

posting 179 times which accounted for just over 21% of all posts. This is because he responds to most of the referral messages that are posted, as well as answers many of the questions asked by other participants. Additionally, he sends out messages with general information to everyone regularly. Midwives accounted for nearly all the other posts and are the regular participants in the group. The other doctor at Bongo District Hospital occasionally posted when the medical superintendent was out of town. The staff at the Bongo DHA commented rarely, largely staying in the background.

How to Read Messages on the Platform

Many of the messages on the platform are in reference to clients[14] and use formal obstetric terminology the midwives use in their daily work. The example below exemplifies how referral messages are phrased, and how all posts regarding clients are supposed to be phrased:

> **Midwife 24 (4:57AM):** Client G1P0 came at 3:19am with fever, headache, chills, LAP, and waist pain for past 3days. Gest 37w3d, SFH 38CM, FHR 112BPM, CONT 3:10 for 20 sec. V/E CX is closed. B/p 110/60, Temp 37.9'C. Iv RL 500mls st, Iv NS 500mls st. FHR 170 BPM at 3:37am. RDT positive. Refer on account of severe malaria and fetal distress. Arrangement for transport not successful, sending client over on their own motorbike.
>
> **Midwife 24 (5:10AM):** Sorry FHR 170BPM at 4:37am.

[14] Midwives in the GHS system are conscientious to call those receiving obstetric care "clients" rather than "patients" because they are not inherently sick like other patients. Rather, these clients come regularly for preventative care. This term is mentioned often in the quotes from the platform portrayed in this chapter.

This message contains many clinical abbreviations. They are explained below:

G1P0 – Gravida (the number of pregnancies) [number] Parity (the number of completed pregnancies/deliveries) [number]
LAP – lower abdominal pain
Gest – Gestation in weeks, days
SFH – Symphysial fundal height (measurement of the abdomen from pubic bone to top of uterus)
FHR – fetal heart rate
BPM – beats per minute
CONT – contractions [number] in [:] 10 minutes, length of time contraction lasts
V/E – Vaginal exam
CX – Cervix
BP – blood pressure
Temp – temperature in Celsius
RL – Ringers Lactate, a mixture of sodium chloride, sodium lactate, potassium chloride, and calcium chloride
NS – Normal saline
st – Stat (immediately)
RDT – Rapid diagnostic test (for malaria)

This is a case in which a woman who was on her first pregnancy arrived at the clinic in the middle of the night after feeling unwell for three days. The mother tested positive for malaria and she was given IV fluids immediately (one bag of Ringer's lactate and one bag of normal saline). The mother was having contractions (three contractions in 10 minutes, each lasting twenty seconds) but her cervix had not started to dilate. The midwife then tried to arrange transportation to Bongo Hospital but was unsuccessful, likely due to the hour. She therefore sent the client to Bongo Hospital on the back of a motorcycle, likely the husband's, as she described it as their own, once she had finished receiving the IV infusions and the fetal heartbeat increased to 170 BPM, which is outside the normal range for fetal heartbeat and indicates fetal distress.

Follow-up to Posts

Shortly these referral messages were delivered, others chimed in:

Midwife 18 (5:14AM): Please you can gave the anti-malaria drug it will help her if is available

Doctor (6:06 AM): *[Replying to Midwife 24's 4:57 AM text]* How far please?

Midwife 24 (6:16 AM): I think they should arrived at the hosp by now

Doctor (11:47 AM): *[Replying to Midwife 24's 4:57 AM text]* Your client has just delivered safely.

Midwife 21 (12:04 PM): We thank God for a successful delivery Doctor we are grateful

Midwife 24 (4:34 PM): We thank God. Thank you Doctor

When a member of the group posts to the platform, every other member can see it. However, other members do not always comment on every post. Oftentimes, a referral post is only acknowledged with an "OK" or "thanks" from Doctor, and sometimes not acknowledged on the platform at all. In this instance, another midwife suggested a treatment, and follow-up on the outcome was provided.

Debate Regarding How to Use the Platform

The following day, another member responded:

Midwife 1 (11:51 AM): *[Replying to Midwife 24's 4:34 PM text]* Sorry she was delivered by ur colleague[15]. Please Doctor only gave us moral support. I will be grateful if u acknowledge us too. Tanx

Doctor (12:22 PM): *[Replying to Midwife 1's 11:51 AM text]* You hear Madam [Midwife 24] lol!!!!!

Midwife 35 (12:57 PM): *[Replying to Midwife 1's 11:51 AM text]* Sorry, we all work as a team and without you pple, we cannot achieve our goal. So we really appreciate ur hard work. God bless u..

[15] Meaning midwife

Midwife 1 (1:25 PM): *[Replying to Midwife 35's 12:57 PM text]* Tanx 4 using de key word "TEAM". We are normally demoralized if u try mentioning certain group of staff without us knowing very well dat dey can't do without de M/W[16].

Midwife 35 (8:09PM): *[Replying to Midwife 1's 11:51 AM text]* Pls always try n give us the feedback but if u allow Doctor to give us the feedback then he will always be acknowledged.

Midwife 24 (8:32 PM): *[Replying to Midwife 1's 11:51 AM text]* Understand u perfectly cause being in the same shoe, after a great effort of monitoring n conducting a delivery successfully like that case, a thank u is very motivating and more fulfilling to the midwife. After all what is our motivation. So ur effort can't be ignored like that my able midwives. That was rather unfortunate if u feel so but my thanks to Doctor was meant for the feedback given which was a great relief to me n I think its prudent to do so. But apologise to all my able midwives as we journey towards a dinner party after a successful end of 2018 as promised 😄😄😄

The next day, Midwife 1 thanked Midwife 24 for her comments, and prompted a conversation about the difficulties of follow-up communication when working in shifts:

Midwife 1 (7:46 AM): *[Replying to Midwife 24's 8:32 PM Saturday text]* Tanx dear

Midwife 1 (7:58 AM): *[Replying to Midwife 35's 8:09 PM Saturday text]* Is unfortunate, u don't know dat we change every 8hrs and de receiving m/w may not end with de case. The caring m/w do call d ward frequently cos dey know de pressure in de Hosp [ie we receive cases 4rm all 6 sub_dist)

Doctor (8:07 AM): *[Replying to Midwife 35's 8:09 PM Saturday text]* 👍👍👍👍👍👍👍 Meaning you people must communicate more on the platform in terms of feedback.

Midwife 24 (8:09 AM): *[Replying to Doctor's 8:07 AM text]* 👍👍👍👍👍

Midwife 1 (8:11 AM): *[Replying to Midwife 35's 8:09 PM Saturday text]* Beside dat since he is de coordinator he often walk or call de ward 2 get feedback if de case does not end in theatre or need any special care A

[16] Meaning midwives

number of times some of u will personally chat with Doctor n he often give u de feedback.

Doctor (8:19 AM): *[Replying to Midwife 1's 8:11 AM text]* Please it is simple. Let all of us try and be giving our subdistricts colleagues the needed feedbacks. It reduces anxiety and also raise their morale. After delivering any case that was brought to the facility, the team on duty should just give a little brief about the case. My thinking please.

Midwife 24 (8:22 AM): *[Replying to Doctor's 8:19 AM text]* That will help us a lot. And its also important to put the case on the platform for easy reference for the one giving feedback.

Midwife 1 (8:54 AM): *[Replying to Doctor's 8:19 AM text]* Good suggestion but will depend on how de ward will be on de said day cos dere are tyms one can't even receive emergency calls 4rm referring sub_dist.

Doctor (9:11 AM): *[Replying to Midwife 1's 8:54 AM text]* This is no excuse. Please let's face facts.

Midwife 1 states that "The caring midwives do call the ward frequently because they know the pressure in the hospital (i.e., we receive cases from all six subdistricts)[17]," insinuating that only the midwives who really care about their patients make frequent follow-up calls to check in on their patients. This also indicates that the referring midwives should take initiative and contact the hospital to find out about their clients, rather than waiting to receive follow-up feedback from the hospital, which Midwife 1 states is under pressure as they receive referrals from every sub-district.

This interaction demonstrates a tension regarding how to use the platform. The midwives in the sub-district are told to post referral cases on the platform and therefore want and even expect feedback in the same manner. Doctor stepped in and agreed with the subdistrict midwives, telling the hospital midwives they should

[17] Rewritten using full words to be clearer

do this for every referral patient. However, the hospital midwives, or at least Midwife 1, feel their workload is too much to also be expected to be posting on the platform regularly. This brings up questions of who is supposed to use the platform: is it appropriate for information to be posted only going "up the ladder" on the platform? Would exempting the hospital midwives from needing to post on the platform dis-incentivize the sub-district midwives from also using the platform? These are important factors to consider when thinking about telemedicine systems broadly.

Directionality of Posts

When analyzing the transcripts of the posts on the Labour Ward platform over the 13 months, I coded each new conversation to indicate if it was from the sub-district level or from the hospital. If there was an ongoing conversation about something and a midwife posted a *new* topic of conversation, such as a referral post, it was coded with a new code indicating directionality. Anytime there was a response or follow up to a post, it was not coded again. One code was used to indicate if a post was coming from a midwife at a facility within the district (either health center or CHPS compound, but not hospital). Another code was used to indicate when posts came from the district level (either the doctors, the hospital midwives, or the district health assembly). There was near equal participation between the health facilities and the district hospital: there were 64 new conversations initiated from the health facilities and 61 new topics of conversation from the district level.

Examples of posts from the sub-district level included referral posts, asking non-emergency questions (e.g., “Pls help diagnose this baby [attaches three photos of infant with very large birth mark on left side]”), asking for follow-up information on clients that had been referred to the hospital, thanking hospital staff for their work, and case studies (messages to prompt discussion on how to handle certain situations, often fictional scenarios forwarded from other platforms but occasionally real examples from encounters in the health facilities). Posts from the district level included client follow-up, reminders about meetings or trainings, general reminders (e.g., **“**pls we don’t give vitamin A any more. According research dere is sufficient vit.A in de breast milk 4 de 1st 6mths.”), admonishment, photos and descriptive case summaries of unusual cases, discussion of the zero maternal death goal, and alerting everyone when there is a maternal death.

The numbers of posts from each level demonstrate that the platform is being used bi-directionally between the two levels. Client follow-up posts from the hospital did increase after the conversation above occurred, but they do not always happen. Additionally, sometimes when a midwife at the subdistrict level posts a question, it is not always answered. In general, however, posts from both levels receive responses and there is regular participation from both the sub-district level health facilities and the district hospital.

Time Between Posts

In the analysis of the transcripts, each new “date stamp” was coded to indicate the number of days elapsed between posts. This was done in order to determine how frequently the platform was being used. The platform was being

used often, with posts every day being the most common (67 times), followed by every other day (23 times), followed by every third day (11 times). Longer intervals between posts were less common. The longest interval between posts recorded was 33 days.

Major Themes of the Platform

This section summarizes the major types of posts and themes that arise on the platform. The Labour Ward platform is intended to be a professional tool for midwives to use in their work. Therefore, nearly all the posts were directly related to cases or the midwives' jobs broadly (such as reminders about meetings), and there were very few non-sequitur posts. Beyond categorizing posts into categories such as "referral" (50 posts) and "client-follow-up," (70 posts) there were several major themes found within the posts: namely, professional recognition, religious references, zero maternal death goal, uncertainty, admonishment, and comradery.

Professional Recognition

The most common type of post within the platform was comments of praise (133 posts). As can be seen in some of the posts in the previous section, the midwives encourage each other with comments such as "well done," thanking each other for the work that they do, and congratulating each other for successful deliveries or case resolutions. In general, the tone on the platform is polite and cordial, and praise from fellow midwives and Doctor is potentially motivating to keep using the platform, as well as to truly "keep up the good work."

This type of praise and encouragement from others is important, because it is often not reflected in the daily work at the clinics. Uncomplicated deliveries often go unacknowledged. There were a number of times when I was in the ANC ward with a midwife and she left for some time, only to return and tell me that a client had delivered. The midwife would then continue on with her work of providing antenatal care, as conducting a delivery is a routine and expected part of her job. At Tiisi Health Center, the maternity ward is somewhat segregated from the OPD ward, and nurses on the OPD side are often oblivious to the goings-on in the maternity ward, including as to when deliveries occur, so they rarely congratulate a midwife on a job well done. Clients and the family members that accompany the clients do thank the midwife after a delivery, but acknowledgement from peers, particularly other midwives, is appreciated.

Religious References

The second most common theme found in the posts were religious references (110 instances), often thanking and praising God after the outcome of a case is posted. These types of comments were often general comments such as "we thank God," "God bless you," and "amen." For example, after a case summary of a near-miss[18] was posted, participants thanked and praised God.

> **Doctor (12:17 PM):** NARROW ESCAPE!!!!!!! We just successfully delivered an Eclampsia who fitted twice[19]. For fast and timely intervention, we could have recorded a death. This woman was referred from [Redacted community] to [Redacted CHPS] with BP of 170/100 [14 days prior] but did not go but reported at [Redacted CHPS 2] yesterday who also referred to Bongo on accounts of high BP. She reported at Bongo at 6:30pm yesterday where she

[18] A "near-miss" is when a woman survives a life-threatening complication from pregnancy.
[19] Had two seizures

started fitting and HB checked was 6g/dl. We were lucky to be successful by transfusing and pulling the baby out[20]. Baby is fine, mother is stable. Please once again let's be careful.

Midwife 18 (12:22 PM): Thanks so much

Midwife 32 (12:25 PM): *[Replying to Doctor's 12:17 PM text]* Hmmmm asem[21] ooo

Midwife 44 (12:42 PM): Thanks be to God for your timely intervention God bless you and the team AMEN

Midwife 1 (1:12 PM): Ameeeeeen and tanx

Midwife 36 (1:26 PM): We give thanks to God

Midwife 49 (1:28 PM): *[Replying to Doctor's 12:17 PM text]* Wonderful God is great

Midwife 1 (2:02 PM): is very true oooo

In this example, as well as many others on the platform, God is praised and thanked for the positive outcome.

In another example, a midwife referred a client to Bongo Hospital when she could not find the cervix to determine the amount of dilation, though the client was clearly in labor. Upon examining the woman, the medical superintendent confirmed she had "no visible cervix" and the baby was delivered via Cesarean section. Later, midwives asked for further explanation regarding the case, so Doctor explained that the client had a congenital absence of the cervix and posted a picture for all to see. The photo was of the interior of the vagina and the doctor explained that the

[20] Meaning via Cesarean section
[21] Ghanaian slang for problems

"pinhole" visible in the photo allowed sperm to travel to the uterus[22]. A midwife commented,

> **Midwife 14 (6:36 AM):** God is so wonderful.

Another agreed:

> **Midwife 26 (7:37 AM):** *[Replying to Midwife 14's 6:36 AM text]* I tell u

The absence of a cervix is highly dangerous. If this woman had chosen to deliver at home, she would have not been physically able to push the baby out. Prolonged second-stage of labor is nearly always fatal for the baby, and can lead to issues such as obstetric fistula, ruptured uterus, and even death for the mother.

Zero Maternal Death Goal

In late 2018, there was a great deal of anticipation for Bongo District to reach its goal of having zero maternal deaths for the year. This was reflected on the platform, with frequent usage and comments referencing reaching the goal. For example, in response to a referral post about a client who had a seizure in a health center due to pre-eclampsia and malaria, another midwife posted:

> **Midwife 9 (12:17 PM):** Good work done Madam midwife. On the way to maternal zero….

Bongo District did in fact reach its goal of zero maternal deaths for 2018, which was celebrated both on the platform and off, with a parade through Bongo (see Figure 5.1) and a large party hosted by the Bongo DHA.

[22] And, ostensibly, menstrual blood to pass out of the uterus, thus giving the woman no reason to know that she did not have a cervix. Routine pelvic exams and Pap smears do not occur in resource-poor settings, even during ANC appointments, so the absence of the cervix wasn't observed until delivery.

Figure 5.1: Banner created for the parade celebrating the achievement of having zero maternal deaths in Bongo District in 2018.

Unfortunately, there was a maternal death March 28, 2019. The group was informed the following morning:

> **Doctor (6:47 AM):** Hmmmmmmmmmm! Had a maternal death yesterday in the evening. We are really saaaaaaaaad!!!!!!

Many midwives posted their condolences that day. However, no midwife posted again until May 4, 2019, a full 36 days later. In the time between, the only posts were from Doctor, who posted several admonishment comments (detailed in the admonishment sub-section below).

The difference between number of posts when everyone was excited about reaching their goal of zero maternal deaths and the sudden lack of posts after a death was striking. Two months after the maternal death, when there had been very little activity on the platform, a "family meeting" was called for all midwives to come

to the district hospital to discuss how to move forward with the zero maternal death goal (the goal was now revised to only record the one maternal death for the year). During this meeting, use of the platform was discussed. Everyone recommitted to using the platform again, and a midwife from a subdistrict facility posted a referral case the morning after the meeting. Doctor stated that he would reward her for being the first message with two bottles of malt, also called Malta (which is malted soda, a popular drink in Ghana).

> **Midwife 34 (8:03 AM):** Good morning Dr. I get woman G2,P1 ,gest_41 wks ,sfh_42cm, fhr_132bpm,bp_100/50, pulse _80cpm,Resp_18cpm . HB_9.8 .she complained of losing liqoua[23] yesterday. Without any sign of lobour, I there refers her for feather mgt.
>
> **Doctor (8:06 AM):** That's great. My first message. I owe you 2 bottles of malt. Remind me.
>
> **Midwife 1 (9:02 AM):** Well done, she is over qualified for referral. With gest.41wks,SFH 42 and loosing liquor she should not waste time at all💃
>
> **Midwife 54 (9:13 AM):** Pls we have received the client and membranes are fully intact with 5cm dilated, so we are monitoring for possible SVD[24].
>
> **Midwife 54 (9:14 AM):** So please Doctor, you owe morning staffs two bottles of Malta each(6 staffs)
>
> **Midwife 54 (10:14 AM):** Client have delivered successfully
>
> **Doctor (11:12 AM):** *[Replying to Midwife 54's 9:14 AM text]* I'm in trouble ooooooooooooh!
>
> **Midwife 34 (5:20 PM):** *[Replying to Doctor's 8:06 AM text]* I will pass by tomorrow n get my malt 😂😂😂

[23] This was mis-typed, and should have been "losing liquor." "Liquor" is a term used to describe amniotic fluid. Premature loss of amniotic fluid can indicate issues with the placenta, such as placental abruption, where the placenta detaches from the uterine wall before the baby has been delivered.

[24] Spontaneous vaginal delivery

> **Midwife 34 (5:22 PM):** *[Replying to Midwife 54's 10:14 AM text]* Thanks so much hospital staffs

This was the beginning of the resurgence of the usage of the Labour Ward platform. After the family meeting, midwives posted referral cases and questions regularly again, with new posts every day or every few days. There was a second maternal death on July 2, 2019, but there was continued regular usage of the platform in the days and weeks following.

Uncertainty

Uncertainty has been discussed by anthropologists as a theme in a variety of contexts. It often arises in anthropology of reproduction literature, as pregnancy itself can be considered a state of uncertainty. There are some basic, universal uncertainties in all pregnancies: what will the baby's sex be? Will the pregnancy make it to full term? Will the baby be born healthy? Will the mother survive the delivery? Modern technology, when it's available to access, allows us to answer many of these questions while the baby is still *in utero*, and access to quality care greatly reduces the uncertainty surrounding pregnancy and the delivery. However, when technology and qualified care are not available or easy to access, uncertainties about pregnancy often transform into conceptions of risks.

While risk and uncertainty in pregnancy has been examined from the perspectives of pregnant women and their families and in regards to traditional birth attendants, there is a dearth in the literature regarding risk or uncertainty and biomedically trained obstetric care providers. In the scenario from Chapter Three, Ellen and the other nurses were uncertain about how to handle most of the cases

that came into the maternity ward that day, and called the midwives many times to help guide them. It is important to understand not only individual's knowledge about risks but also their uncertainties in particular situations, and how both of these things influence perceptions of self and actions taken to address said risk or uncertainty (Obermeyer, 2000). Obermeyer (2000) was examining concepts of risk regarding the continued utilization of TBAs after Safe Mother Initiative policies came into effect in Morocco. However, her framing is still particularly useful when thinking about risk and uncertainty in the context of Tiisi Health Center and the Labour Ward platform.

When it comes to risks in pregnancy, midwives in the GHS system are the most knowledgeable with the exception of obstetricians, who are few and far between. Even the physician's assistant at Tiisi defers to the midwives for any pregnancy-related questions or treatment. What happens when the person who knows the most about pregnancy for miles around is uncertain about a particular case? In a hierarchical system in which a midwife holds power because she has knowledge no one else has, how can she express her uncertainty? The majority of the time, cases are referred because that is what protocol stipulates. However, there can be moments of uncertainty prior to taking the step of referring a patient.

Ethnographic Vignette – An Uncertain Midwife

One morning before beginning examinations, Vivian looked out into the waiting room and noticed that many of the women were close to their due dates. She decided that she wanted to do a short lesson about birth preparedness for the soon-to-be mothers. She explained to the women that when they are in labor and

are coming to the clinic, there are a number of items they must bring with them: plastic sheets (to protect the clinic beds from being soiled), polythene bag to put the placenta in (so that the mother-in-law can take it home to be buried), pads, cloths to clean and swaddle the baby, clothes and a hat for the baby, and soap.

During the lesson, a woman, "Azumah," raised her hand and stated she was having contractions, so when Vivian finished she took Azumah to the labor ward to be examined. She undressed, urinated in a bucket as instructed, and climbed onto the labor table so that Vivian could measure her abdomen, which was 30 cm. Based on her antenatal record book, Vivian guessed Azumah might be closer to 35 weeks gestation with a small baby. She then took the fetal heartbeat doppler and listened. After moving all around the abdomen for several minutes, she said, "Where is my baby's heartbeat?"

Alice fetched the ultrasound machine[25] and Vivian turned it on. It took about a minute to boot up, and then the screen read "error" due to the battery not being sufficiently charged. Vivian sighed and stated that she charged it yesterday, but she would try charging it again. Meanwhile, she turned back to the patient, whom she was concerned may have had either malaria because of her fever, or possibly pre-eclampsia because of her foot edema. She took a urine test strip and put it in the bucket where Azumah had urinated. She lined up the test strip to the bottle and held it up close to the window to compare the colors and found the protein markers to be

[25] A recent donation from UNICEF, this is a small, portable, rechargeable ultrasound machine. The ability to conduct ultrasounds at health facilities, rather than having to send clients to labs to get scans that cost the equivalent of $5 USD, has been very helpful. UNICEF trained one midwife per facility on the machine, and the midwife was tasked with training the other midwife at her facility. Vivian did train Sandra, but Sandra lacked confidence using the machine, and largely left scans for Vivian to do.

a little high. Vivian set this aside, then performed a vaginal exam and said, “Thank God, the cervix is intact.” Satisfied that Azumah would not deliver anytime soon, she took her ultrasound machine to the ANC ward to charge and to continue with regular antenatal appointments while Alice took Azumah to the lab for a malaria test.

Back in the ANC ward, a client who came in for routine care told Vivian she felt sick. When Vivian did a rapid malaria test, it came back positive. “During malaria season, the way we get preterm deliveries,” Vivian said, shaking her head. Again, Vivian stated that she suspected Azumah was having contractions as result of malaria. However, the lab results came back and the slip of paper the lab technician handed Vivian stated: “no MPs [malaria parasites].” Vivian decided she wanted to do a rapid test as well because she couldn’t believe Azumah did not have malaria. By now, it was mid-afternoon and Vivian still hadn’t gone back to check for a heartbeat even though the ultrasound machine had turned back on hours ago.

Alice brought back the rapid test she did for Azumah in the labor ward, which was also negative for malaria. At this point Vivian stated, “everything is normal, so why is she contracting? I will ask Doctor.” As she pulled out her phone, she hesitated, and decided she wanted to check for a heartbeat again before calling Doctor. Back in the labor ward, she turned on the ultrasound machine and slowly moved the doppler all around the uterus, inspecting the fetus’s head, its spine, and its legs. There was no fetal movement or fetal heartbeat. She noticed the placenta was “not normal;” it did not have smooth edges and seemed to have holes, and or as

Vivian described, it looked like it was “disintegrating.” At this point, it was evident the fetus was dead. “So what happened?” Vivian wondered.

Returning to the antenatal room, Vivian sat down at her desk and started to compose a WhatsApp message to the platform. She included the patient history since arriving at the clinic and emphasized “fetal heartbeat ABSENT.” She started to write that it was an “IUFD [intra-uterine fetal demise] case” but then erased it and said she didn’t want to make that statement, but rather phrased it to ask Doctor to confirm. It took her nearly an hour to compose the message, partly due to regular interruptions by other nurses and clients. In the meantime, Azumah had been informed she was being referred to Bongo Hospital and she tried to leave the clinic to go home. Alice stopped her and told Vivian that her client was leaving. Vivian stated, “No, I won’t allow it. We must find someone to take her on the moto right now to Bongo.” She managed to find one of the community health volunteers to take Azumah on the back of his motorcycle, and they left before Vivian finished her message. She ended it by saying that the patient was being referred and that they were already on their way. Later, she checked her phone and saw that Doctor had acknowledged her referral and had responded, “Thanks.” She smiled and said with a hint of pride, “Anytime we call Doctor to say we are referring a patient, he just prepares the theatre. He knows if a case is coming from Tiisi, it’s serious.”

This case highlights how uncertainty plays a role in referrals and in using the WhatsApp platform. Vivian was uncertain throughout the day as to why this client was in this condition. She took several steps to try and determine the cause of the contractions, but was unable to concretely determine a cause. Interestingly, the one

thing she was sure of was that there was no fetal heartbeat, but she was unwilling to make a declarative statement in her referral message that it was intrauterine fetal death, and rather deferred to the doctor to confirm that this was the result.

In this particular instance, perhaps because Vivian was unsure of the cause of the fetal death, she used uncertainty in her phrasing of the result to negotiate her insecurity. Additionally, allowing the doctor to make the final call that the fetus was indeed dead could be seen as a way to conduct and maintain her relationship with the doctor by expressing a deference to his position and additional training.

This case also highlights the long delays patients can face prior to receiving care. A significant potential benefit of telemedicine is the fact that care, or at least consultation, can be accessed immediately over long distances. In this case, other demands of the job (seeing to all the other antenatal care clients), malfunctioning technology, uncertainty regarding a diagnosis, and lack of transportation all contributed to the delay of Azumah receiving care. When Vivian finally did turn to the platform, it was not to seek advice or consultation, but to report the referral. Had she turned to the platform earlier in the day for consultation, she may have been encouraged to send the client to Bongo Hospital sooner.

Asking Questions, or "Fruitful" Uncertainty

Protocols, to be sure, offer concrete solutions when there is uncertainty in treating patients. Often with maternal and child health cases, the "safe" thing to do is always refer to the next level of care. However, teleconsultation over WhatsApp like the Labour Ward platform offers a new potential way to address risk and uncertainty. Cooper and Pratten (2015) argue that uncertainty is "a positive, fruitful,

and productive framing . . . a social resource and can be used to negotiate insecurity [and] conduct and create relationships" (p. 2). Indeed, for the purposes of the Labour Ward platform, uncertainty about a case can invite discussion and debate. This was seen 23 times, when midwives posted both hypothetical and real scenarios in which they elicited the input of others.

For instance, one day Vivian received a patient at Tiisi who was pregnant despite having implanon, a long-acting reversible contraceptive (LARC) implant. Vivian decided to use this example as a "case study" for the platform:

> **Vivian (11:41 AM):** Good morning to u all. Pls I had a case that I want us to study and make inputs for our learning purpose.
>
> A client visited the [Tiisi] health centre with a card which showed she had taken implanon in January 2018 with about ?24wks pregnant. Urine test for pregnancy was positive.
>
> What left us dismayed was for the fact that implanon is in situ and for about 1year 9 months only for her to come with a pregnancy of about 6months. She was counselled and referred for routine lab investigations and scan. I intend to refer her to doctor for thorough examination afterwards.

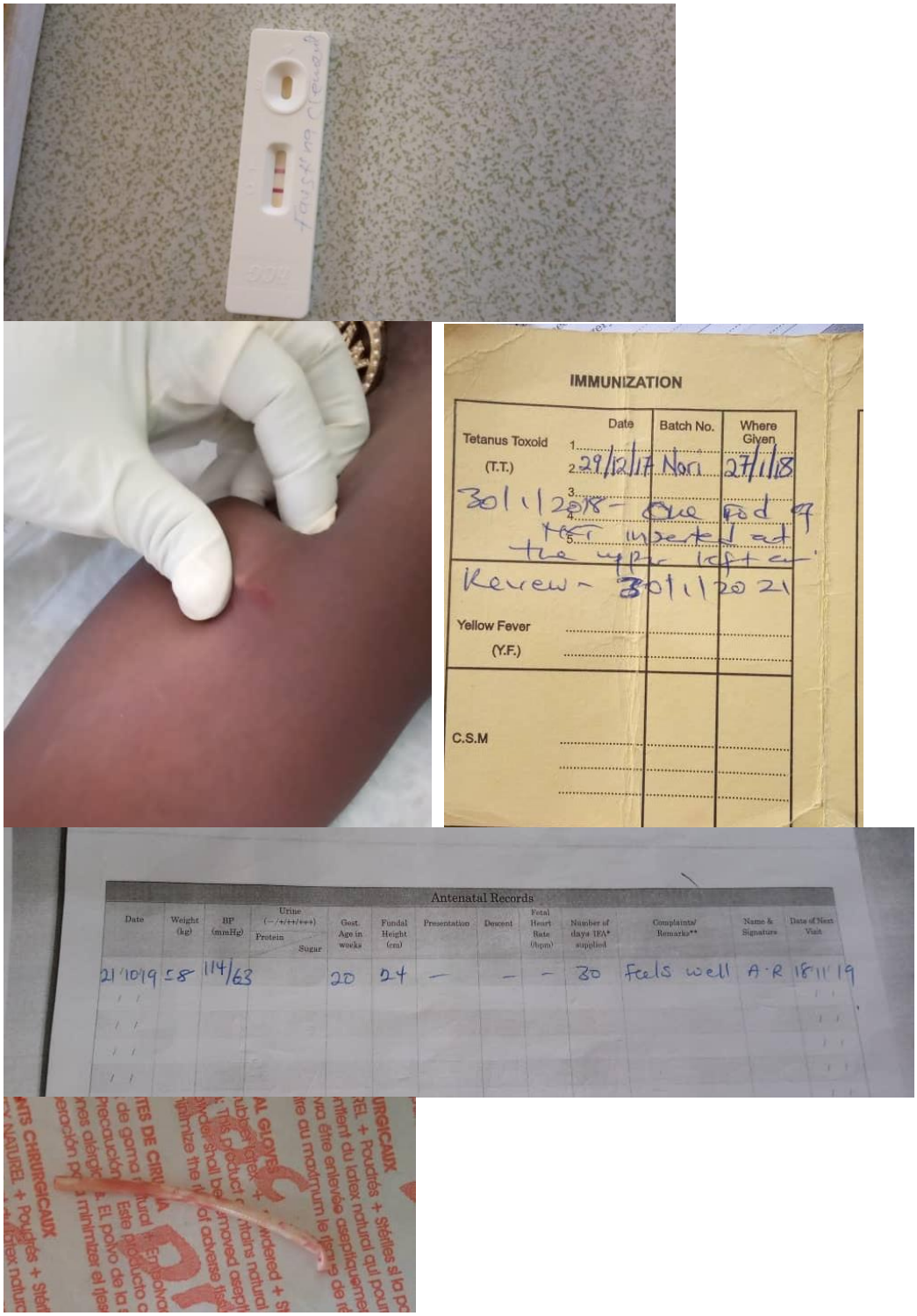


Figure 5.2: Photos from top left: Positive pregnancy test; client's arm with implant visible; card given to client with date of implant insertion (January 30, 2018); antenatal record book for client, with gestation guessed to be 20 weeks, with a fundal height of 24 cm; implant after removal.

Vivian (11:44 AM): Above are pictures for us to appreciate the situation

Vivian (11:49 AM): The question is how did it fail.

Doctor (11:49 AM): I plan on is about 99

Doctor (11:52 AM): I mean inplanor is about 99% efficient. This client may be that 1% failure rate.

Midwife 47 (12:01 PM): she can be pregnant due to her system bec we all know that all family planning devices are NOT hundred percent .

Midwife 47 (12:01 PM): may be she is the type that easily failed in the method use

Vivian (5:45 PM): Well the insertion was done in Kumasi a community call Agric. But no facility name was indicated, no batch number or expected date of expiry recorded. So I fell that
1. maybe the it was expired even before insertion due to either negligence on the part of the professional.
2. Could also be error from manufacturer.
3. She is among the 1% failure rate.

LESSONS LEARNED.
1. Its important to cross check the expiry date of every device before given.
2. Record batch number and the expiry date of device in register and clients card for follow up to manufacturers for investigation in such cases.
3. Remember to counsel client on percentage protection of device.
4. And use of FEFO[26] on store management of our medicines

Vivian herself was confounded and "dismayed" that a woman who opted for a long-term birth control method still became pregnant. She felt this case provided a good opportunity for discussion and learning for all midwives, and posted it to the Labour Ward platform. Examples such as these are learning opportunities for all which everyone can learn from.

[26] It's likely Vivian meant to say "FIFO," or "First In, First Out," a common strategy for any organization that stores perishable goods.

Admonishment

On occasion, “admonishment” posts are sent out (23 posts). These are nearly always done by the medical superintendent, and these types of posts are firm reminders regarding important things midwives should be paying attention to or doing in their daily work. His status in the GHS hierarchy allows for, and even necessitates, that he do this. He is the ultimate authority for medical cases in the district and poor outcomes for cases ultimately reflect on him and his leadership. Therefore, he calls attention to cases that are not handled properly or have potential for bad outcomes. For instance, below are the admonishment comments the medical superintendent posted after the first maternal death in 2019:

Tuesday, April 2, 2019

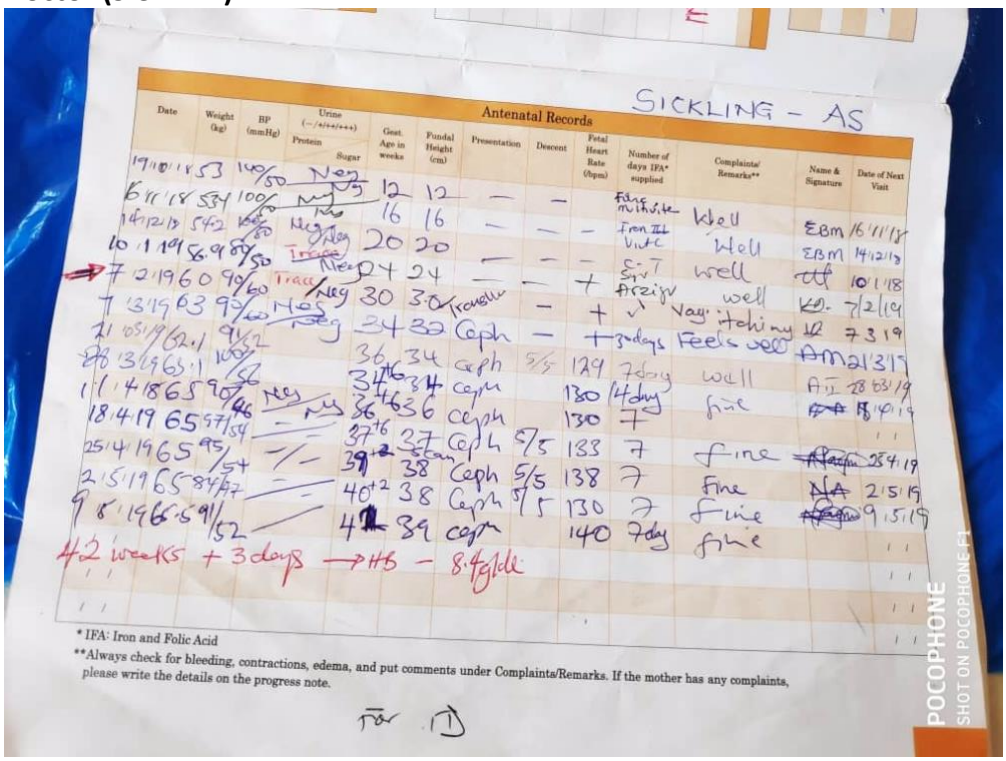
> **Doctor (8:29 PM):** [Posts photo of referral form and maternal record book]
>
> **Doctor (8:34 PM):** Look at the HB done on three consecutive times. This patient was brought to us this morning when labour is almost setting in. Is it that we are forcing to add a second death? Please let's sit up.

Saturday, May 4, 2019

> **Doctor (10:16 AM):** [Photo of maternal record book]
>
> This client was seen on 15/02, 12/03 in both instances with severe anaemia and only referred on 04/05 with HB of 8g/dl in labour. Is it fair?
>
> **Doctor (10:41 AM):** Luckily HB done in labour is 10.3g/dl. Please let's be vigilant.

Friday, May 10, 2019

Doctor (9:37 AM):



👆👆👆👆👆👆

Midwife 52 (11:27 AM): We need to get serious abit

Midwife 52 (11:27 AM): What's this

Midwife 30 (11:44 AM): Hmm it seems all that [Doctor] has been saying **"please let's be vigilant""** has fallen on deaf ears.
Able midwives it's high time we wake up from our slumber.

The photo shared is of the maternal record book for a client. In red, Doctor filled in the last line with “42 weeks + 3 days –> HB – 8.4g/dl.” Protocol stipulates that women should be referred to Bongo Hospital if they have reached 41 weeks’ gestation and are not showing signs of labor. The protocol for pregnancies that have gone beyond 42 weeks is to deliver via Cesarean section[27]. Bongo Hospital much

[27] This is done because by 42 weeks’ gestation, the baby’s head may have grown too large to pass through the pelvis, making a vaginal delivery dangerous.

prefers when women are referred at 41 weeks, as they can induce labor and have clients deliver vaginally. There have been several instances of admonishment posts regarding clients who are referred at 42 weeks' gestation or more. Additionally, in all three cases listed above, the hemoglobin levels indicate moderate to severe anemia. If the hemoglobin level is below 8.0 g/dl, surgery cannot be performed until a transfusion is done, as the blood loss would be too much for such an anemic patient. Cases such as these make the work dangerous and difficult for the hospital staff.

Comradery

The final theme I will discuss from the platform is a sense of comradery that is created in the group. This is reflected through joking (32 instances) and often entails use of many emojis (35 instances). Some of the joking can be seen in previous examples, like when the hospital midwives told Doctor that he also owed them all bottles of Malta and he responded that he was "in trouble." In another example, some midwives invite others to join them for food and drinks:

> **Midwife 1 (4:20 PM):** [Photo of food and drinks]
> Plz we have started with our's. U are invited[28]
>
> **Midwife 30 (4:50 PM):** *[Replying to Participant 1's 5:20 PM text*] Thanks.
>
> **Midwife 35 (4:51 PM):** Pls wait for me.. 🏃‍♀️🏃‍♀️🏃‍♀️🏃‍♀️🏃‍♀️
>
> **Midwife 30 (4:52 PM**): *[Replying to Participant 35's 4:51 PM text]* My friend jx return because it's finished
>
> **Midwife 8 (5:02 PM):** Please I will join you very soon 🚴‍♀️🚴‍♀️
>
> **Midwife 1 (6:59 PM):** 👍

[28] "You are invited" is a common polite phrase. Anytime someone has food, they invite others to share.

Midwife 1 (7:00 PM): Speed up

Midwife 1 (7:01 PM): Left with last bite

Midwife 1 (7:03 PM): Bicycle not allowed

Midwife 43 (7:20 PM): What of cando[29] 😂😂😂

Midwife 1 (7:47 PM): May consider 😄😄😄

Midwife 35 (8:59 PM): *[Replying to Participant 30's 4:52 PM text]* Eiiih

Midwife 8 (9:56 PM): Okay coming with 🚗🚗🚗🚗🚗 so please don't finish it

Midwife 1 (10:46 PM): Waiting 😀😀😀😀

In this exchange, the midwives are clearly having fun with each other, and are teasing one another. As it was posted to the platform, all midwives in the district were invited to come and join in Bongo. They very likely were not still at the spot[30] at nearly 11:00 PM when the exchange ended, but the playful exchange continued.

In another example, Doctor announced the date and time of the celebration party for achieving the goal of zero maternal deaths. After several commented about their excitement to attend, one midwife joked that she could not make it because she does not have shoes:

Midwife 35 (9:50 PM): *[Replying to Participant 38's 5:53 PM text]* Pls I'm in [Redacted] i don't hv shoes...

Doctor (10:10 AM): *[Replying to Participant 35's 9:50 PM text]* Will offer you one of my shoes.

[29] Referring to "can do" or tuk-tuk (see Figure 1.2 for example)
[30] Bars and places that sell food are simply called "spots" in Ghana.

Midwife 32 (10:13 AM): *[Replying to Participant 38's 10:10 AM text]* Hahahaha

Midwife 51 (10:38 AM): Ooo! male shoe

Midwife 35 (11:38 AM): *[Replying to Participant 38's 10:10 AM text]* 😂🤣🤣🤣..then u hv to add socks

Doctor (2:48 PM): *[Replying to Participant 35's 11:38 AM text]* It's ready dear.

While the majority of conversations on the platform are formal, serious, and concerning dangerous matters, occasional joking relationships such as these emerge to demonstrate that there is a congenial relationship between the midwives at both levels and the medical superintendent who oversees them. This is a demonstration of the strength of relationships they have built with each other, which may indicate why they are willing to use the platform as much as they do.

Part 2: The Rural Maternity Ward

This section provides examples of midwives' experiences performing their work at various health facilities in Bongo District, including Tiisi Health Center. It details how they use the Labour Ward Platform in their work, and looks at expectations of midwives more broadly.

Focus Group Data

In the focus group that occurred with midwives, the attendees were asked how the platform works (including how things like feedback and referrals are supposed to work, and what types of cases should be posted), what they like about

it, what they dislike about it, how often they check the platform, if they feel it has helped achieve the goal of zero maternal deaths, and how the platform could be improved.

Interestingly, the midwives described the platform as a way to build their knowledge, which was expressed by the GHS administrators as a goal and intended outcome of the national telemedicine program at the TCC. For instance, one midwife expressed:

> *The platform too also helps us to learn because there are cases that we see managed on the platform. So if something like that occurs at your place you will know what to do.*

Another stated:

> *The platform too is also good because in areas where there is network, normally there are suggestions that is given. You know there are some cases, you'll be there, you won't know what to do. But with their suggestions, you will know what to do before you refer.*

Both of these quotes exemplify how they learn from the platform. Additionally, providing teleconsultation over a group chat on WhatsApp allows for everyone to learn from the cases, not the singular caller at the TCC.

Regarding usage of the platform, the midwives who work at the hospital stated that they prefer midwives at the sub-district both post on the platform and call the labor ward phone line to report the referral. The reason for this is that sometimes the midwives do not have the data turned on for their phones and they miss posts on the platform, but they will still receive the information via the phone call to the ward phone. Those who are not in the room when the call comes in may see it on their cell phones via the platform. Thus, reporting a referral both on the platform and through a phone call is best to ensure everyone is aware and prepared

to receive the referral. However, returning to the fact that midwives do not always have their data turned on, others expressed issues with WhatsApp requiring data as well, such as:

> *I want to add that for some of them in the villages, the network is not there. It's a problem because sometimes we prefer the phone call than the message because you have to now roam and search for network to send.*

Regarding feedback, one midwife explained that feedback is always provided. Sometimes it is on the platform, sometimes it is on the referral feedback form, and sometimes it is in the form of a phone call. The phone call is preferable, she explained,

> *But when you call, you get the feedback immediately. You know what has happened.*

Another chipped in,

> *Most of them are always anxious to know the end result so they will call to find out the case ended.*

It appeared the midwives agreed that over-the-phone feedback was simplest and best, ignoring the back and forth months prior about needing to provide feedback on the platform highlighted above.

Other issues with the platform arose as well. For instance, some expressed concern about having to type out cases on the platform in emergency situations:

> *It takes time. Like let's say you have a bleeding case, how to stop and type? Normally, we are few there. Sometimes, we are alone. So, how to stop, remove your gloves, and go and type?*

Others agreed, and explained that in true emergency cases, the referring midwife only calls and does not post to the platform.

The midwives were asked how often they check the platform, and a number of them chuckled:

Whenever there is credit,

one explained. Whenever a phone's cellular data is turned on, data is running in the background, even when one is not actually using the phone, to check for updates, messages, etc. Many people who buy prepaid phone credit are conscientious about how much data they use, and turn off their data strategically to save money. Provision of phone credit to have data, as well as provision of new smart phones were both suggested as ways to improve the platform and ensure all midwives use it. However, this does not address the issue mentioned above, where the midwife has to wander outside with her phone looking for a data signal before being able to send a message, or in emergency cases, particularly when the midwife is alone.

Stress in the Maternity Ward

Stressful working conditions was a theme that arose in the focus group, as indicated by the quote above where the midwife described working alone on obstetric cases and not having time to stop, remove bloody gloves, and type a message to the platform. Stressful situations were regularly seen in the maternity ward at Tiisi. Hundreds of hours of participant observation at the health center in Tiisi allowed me to witness the routine and the unexpected, the challenges and shortcomings, and the ways in which the midwives regularly went above and beyond the expectations of "regular" nurses. Babies can come at any time, and therefore the midwives are on call 24 hours a day, seven days a week. While I only observed the

midwives during normal working hours (between 9:00 AM and 5:00 PM Monday through Friday)[31], I saw a variety of examples of how stressful their jobs really are.

As demonstrated in previous ethnographic examples and in the examples provided from the WhatsApp data, the work and lives of the midwives are constantly stressful because at any moment they could be faced with handling a life or death case, and must handle these circumstances much more frequently than OPD nurses. Additionally, midwives are sometimes posted to very remote areas away from their families, where they must stay for the majority of the year because there needs to be at least one midwife on duty at all times. These conditions and constant responsibility would be stressful to anyone. Below are two examples of instances when stress impacted Sandra and was reflected in her work.

Ethnographic Example 1:

Sandra has been the only midwife at Tiisi for a full month now that Vivian has been on maternity leave. Mid-morning, she disappeared from the ANC ward for about half an hour. When she returned, she said that the electric company came to shut off the power in the nurses' quarters. She was very upset and flustered; "Every month I go around to and ask everyone to go and pay their part but they didn't and now we don't have light." She continued, "You send me to this village and my tele [TV] is my only form of entertainment, how can you take that away and expect me to

[31] I did not stay in Tiisi, but rather would commute from Bolgatanga daily. This was not ideal for a number of reasons, but my multiple attempts to arrange housing in Tiisi failed. After I had been at Tiisi for roughly nine months, Sandra told me that in 2017 a German nurse was living in the nurses' quarters and died unexpectedly. Persistent rumors that juju, or evil magic, caused her death led to the staff discouraging me from living in Tiisi, though they did not tell me this was the reason at the time.

be here?" She complained about how when people are transferred to new posts, they don't pay their bills before leaving. She also lamented, "one person died leaving arrears."

A client came in and stated that she was referred to Bongo the previous day but the nurse on duty did not give her a referral slip. She said, "you know if you go without any form, the doctor is very busy and you can be waiting-aaaahhhhh." It took Sandra over an hour to write the referral slip for the woman because she was so distracted by the electricity predicament. In the afternoon, five women came in for pregnancy tests and new antenatal cards, but Sandra ended up collecting their phone numbers and told them to come tomorrow because "my mind is hot" and "the quality of care won't be good." She was indecisive about what to do with a client who was 41 weeks' gestation. The protocol for cases such as this is to refer to Bongo so that labor can be induced. "We refer so many from here" she said dejectedly, and decided to also tell her to come back tomorrow.

Ethnographic Example 2:

A woman, "Beatrice," was laboring in the lying-in ward. Sandra explained, "At 7:00 A.M. she was 3cm, but she is a primate[32], so it may take long." Indeed, she labored throughout the day. Sandra was called in several times by the mother-in-law to check on Beatrice, who was always squatting or sitting on the floor and clearly in a lot of pain. Each time, Sandra performed a brief vaginal exam, declared she is not

[32] Derived from the conjunction of primary and maternity, the term becomes "prim-mat," but is pronounced like "primate." It is fairly startling to hear a midwife call a client a "primate" for the first time without realizing what the term is supposed to mean.

ready, and went back to clients in the antenatal ward. Finally, around 3:00 P.M., she was fully dilated. Now in the labor ward, Beatrice sat up on the edge of the delivery bed and rocked side to side. "*Ga'are!* (Lay down!)" Sandra yelled harshly. "Oh, Madam…" Beatrice moaned as she leaned forward and reached a hand toward Sandra, attempting to rest her head on Sandra's shoulder. "*Ga'are! Ga'are!* Ah!" she yelled and clicked her tongue as she pushed Beatrice back by both shoulders. She reluctantly laid down but started rolling side to side again and Sandra yelled at her to lie still. "The way she is moving like that, the cord will wrap around baby's neck."

Beatrice was clearly uncomfortable in this position and kept trying to move around. Fed up, Sandra called in the mother-in-law, who stood on the other side of the curtain yelling at Beatrice as Sandra also yelled at her. Then Sandra started saying, "*Puse! Puse!* (Push! Push!)" But Beatrice wasn't pushing to Sandra's satisfaction so she called to the mother-in-law again, who came inside the room but still stood behind the door, blocking her view, and demonstrated audibly through grunts how the woman should and should not push. Then Sandra sent the mother-in-law to go outside and buy iced kenkey[33] and told her to put it in a bowl and mix it with water to become runnier. Beatrice had a cramp in her inner right thigh and kept trying to straighten her leg but she would nearly kick Sandra, which angered her.

Beatrice was now becoming visibly weak, so Sandra decided to put in an IV of Ringers lactate. The mother-in-law came back in with the watered down iced kenkey in a metal bowl. She lifted Beatrice's head and tilted the bowl to her mouth so she

[33] Kenkey is a ball of fermented corn flour, which becomes "iced kenkey" when it is mixed with water and sugar and served as a cold drink in a plastic bag.

could drink. After several sips, Sandra told her to push again. Hair from the baby's head was visible in the vagina, but she was making no progress. She continued to try to roll around and stretch her leg; each time she moved, her IV line would get caught around the metal handle of the bedframe and nearly be pulled out. After a while of no progress, Sandra tried a new strategy: she started speaking in a friendlier tone trying to encourage Beatrice to push. "You are doing well, Bea!" At one point, she took Beatrice's left hand and brought it down to touch the baby's hair to show her how close the baby was to being born. "*Awurade!* (God!)" Beatrice cried and laid back flat.

Shortly afterwards, meconium[34] started to leak out of the vagina. "This baby is in distress" said Sandra. "*Puse! Puse! Puse!"* Sandra reached into the vagina, swiped her finger inside, and withdrew a glove covered in meconium. She held up her hand for Beatrice to see and told her in Frafra that the baby needs to be delivered now. Beatrice laid flat and screamed loudly, which was very unusual, as Ghanaian women typically remain as quiet as possible during birth as a demonstration of strength. Tears streamed down her face as she started talking about how witches were causing the birth to be difficult. "I have to use the vacuum," Sandra decided, explaining, "if I don't, this baby will be born dead." She quickly grabbed and assembled the vacuum, positioned the suction on the head, and started pumping. Someone knocked on the door and asked Sandra for scissors. "I'm busy!" She yelled. As soon as the head was out, the cord was visible, and was indeed

[34] Meconium is the first bile of the baby, and it is different from all other bile because it is made up of matter ingested while in utero. When a fetus is in distress, it can defecate, releasing meconium into the amniotic sac.

around the baby's neck as Sandra had predicted. The baby's face was blue. There was a loud pop and Sandra detached the hose from the suction on the baby's head, then she deftly un-looped the cord from the neck and quickly pulled the baby out. It opened its eyes and sputtered. Sandra quickly started cleaning off the baby on Beatrice's stomach with high emotion. The nurse who was asking for scissors came in to see what was going on. Sandra turned her to and exclaimed, "Ah! As for this one, if we did not have the vacuum it would have died! They would blame the midwife if this baby died, but how can you blame the midwife when it was just the stubborn patient?"

When it became clear the baby was alright, things started to calm down in the room. Sandra removed and inspected the placenta, which was a greenish color. The mother-in-law brought in a polythene bag for Sandra to place the placenta into. She held it open as Sandra poured bleach inside, then twisted it closed and took it out of the room. Then, Sandra inspected Beatrice and saw that she had torn. She cut a pad into smaller pieces and used clamp scissors to insert them into the vagina to seep up blood. "You're not supposed to do this because cotton can remain inside and get infected, but . . ." She hoped that this would stop the bleeding, but it didn't, so she had to suture.

As she was finishing the suturing, a truck pulled up. "Red Cross" Sandra said, seeing the symbol on the driver's door through the window. She left the labor ward to attend to them. After giving the Red Cross team the information they wanted, she returned. She stood at the end of the bed and said to Beatrice, "Next time, stay at your place! Don't come here again!" Sandra explained that Beatrice lives in another

community down the road and didn't do antenatal care here. The midwife in the community where she lives was pregnant and had gone on maternity leave, and Tiisi was the next closest option to deliver with a biomedical provider.

In both of these scenarios, Sandra allowed stressful situations get the better of her emotions and it was reflected in her work. In the first example, Sandra was very stressed and distracted by having the electricity to her living quarters cut off. While electricity is not as basic a necessity as water or food, it is still highly inconvenient and her frustration was understandable. The amount owed, which had to be paid before the electric company would reconnect the line, was roughly $130 USD. To lose power, and her one way of unwinding from her stressful job, was the icing on the cake after a long and stressful month of being the only midwife on duty at Tiisi and completely flustered Sandra. The nurses who share the quarters with her eventually were able to pool their money and pay the bill, and the power was reconnected by the end of the day. But this example demonstrates how midwives live in stressful places and have stressful jobs, and are sometimes pushed to their limits by things that are outside of the context of their jobs, but are still due to the nature of their work.

Regarding the second example, Sandra's stress stemmed from the fact that that she would be blamed for and would have to live with the guilt of delivering a dead baby. Sandra's role in the Tiisi Health Center hierarchy means she is the ultimate obstetric authority – that is, when Vivian is not around, as she was not that day – and therefore she is responsible for the outcomes of all obstetric cases.

Previous Examples of Midwife Maltreatment

One day, I accompanied John, Barbara, and Jennifer for outreach in a community roughly five kilometers from Tiisi (seen in Figure 5.3).

Figure 5.3: Child welfare outreach in outlying community within Tiisi sub-district.

This type of outreach, known as child welfare days, is done regularly to weigh and immunize children under five. They are nearly always exclusively attended by women and children, but this day there were a number of men in attendance as well. This was because in addition to the child welfare clinic, there was to be a

community health committee meeting and a health education *durbar*[35]. Barbara said the topic would be ANC because while women come for the child welfare days, they do not come to Tiisi for ANC or delivery, and she wanted to know why. After her lecture about the importance of ANC, a woman raised her hand and shared that when she went to Tiisi for labor, the midwife was just "shouting on her" and that she didn't like being treated that way, especially during a stressful time like labor. In response, Barbara suggested that maybe the baby needed to be delivered quickly and the midwives were just encouraging her, though their encouragement may have sounded like shouting. Another woman spoke and said that when she arrived in labor during the night she called for midwives and nurses and no one came quickly to assist her. Barbara said that maybe the midwife was bathing, or asleep, or naked and needed time to prepare herself before coming outside. Another woman said she came on a Sunday and the midwife did a vaginal examination and then left for church. John responded that the midwife must have determined the labor wasn't far along. However, the woman continued to explain that while the midwife was at church, the baby crowned and the midwife was nowhere to be found. Next, another woman said that she came to Tiisi because she thought that she was in labor. The midwife told her she wasn't due yet and to stop worrying her.

John explained to the audience that the old midwife many of these women were likely referring to has retired and is no longer there and the new midwives are not mean like that. An elderly man spoke up and asked why they were even talking

[35] Initially a Persian word meaning a meeting held by a ruler , it was adapted by British colonizers in India to mean meeting more broadly. A legacy of British colonization is that community meetings are still called *durbars* in Ghana today.

about ANC when the midwives just give the women birth control and women no longer get pregnant. Finally, an old woman who is on the community health committee stood and said, “In my day, we had to travel very far to deliver so you all should stop complaining.”

Positive Encounters between Midwives and Clients

The examples above, especially those in which Sandra was involved, are intended to demonstrate how overworked and stressed the midwives can be at times, and how that affects their work and the care they provide. However, instances where the midwives were harsh with clients were few and far between. In fact, the norm was for the midwives to treat their clients kindly and with respect, and that respect was reflected back in how the clients regarded the midwives. For example, many times when clients returned three days after delivering for a postnatal checkup, they would bring a small gift to the midwives, often bars of soap. One brand in particular, Geisha, was especially popular. Once, when I was in the nurses’ quarters with the midwives eating lunch, Sandra asked me if I used that brand of soap. I told her no, and she showed me a large bag full of soap that she had been collecting. She said she also does not use Geisha, and that she tries to give it to the poorest clients as they leave after delivery.

In another example, one day a new mother came into the ward and told Vivian she was worried her new baby was not eating well. Vivian sat down on the bed (see Figure 5.4) in the antenatal ward next to her and asked her to demonstrate how she breastfeeds. She patiently gave suggestions for how to better position the baby for it to feed well, and then watched for at least ten minutes as the baby

sucked. Once the baby was finished eating, Vivian gently showed the new mother how to burp the baby, then sat with the new mother as she asked question after question, and Vivian patiently answered them all. In all, she spent nearly half an hour with the new mother, who left with a smile on her face, looking much relieved. Vivian gave this type of individualized attention to anyone who needed it. On another day, a pregnant woman came in for her antenatal appointment and her hemoglobin level showed she was very anemic. The woman was a farmer and was illiterate, so Vivian found a flip chart that had pictures of various types of foods that grow in the area. She patiently asked the woman which foods she cooks with, and how she prepares them. She then explained which foods are best to eat during pregnancy and made suggestions of things the woman could cook, being cognizant to suggest things she thought the woman could afford, rather than telling her to eat more meat, which was likely out of financial reach for her.

These types of encounters were much more commonplace than the stressful ones in the previous section. Care is very experiential, and it is impossible to speculate whether a good encounter such as these detailed here would outweigh a bad encounter. However, from my observations, more women experience good encounters with the midwives than bad encounters, which could be another reason why the rates of facility-based delivery continues to increase in this region.

Figure 5.4: The bed in the antenatal ward, referenced throughout this dissertation. This is where I often sat while observing antenatal appointments, and is also where Talata from Chapter Four rested before delivering. It is where Vivian would sit with patients to counsel them, and was also used as the designated napping place for the staff's babies.

Discussion

Returning to Pols (2012) theory of the material semiotics of domestication of technology, the iterative and collective process of adapting this technology to suit the needs of the group can be clearly seen. From the discussions about who to acknowledge and thank after a case has been resolved, how and when to provide

feedback, and the importance of continued utilization of the platform, the midwives and doctors in the district are working together to make this system of teleconsultation work for them. Technological barriers, such as lack of network and cost of credit for data are both examples of ways in which non-human actors shape how members platform use it, and how often.

The examples provided in this chapter align with Duclos's (2015) statement that e-health systems "distribute knowledge in ways that encode and reinforce existing relations" (p. 161). The platform demonstrates how standard patterns of power and authoritative knowledge are reiterated even through new technological adaptations. The medical superintendent still wields the most authoritative knowledge and power, which he transmits through the app to provide information for the midwives to learn from, and gives small reprimands to ensure they are doing all they should be in the care provided at the sub-district level. The platform provides a method through which he can more easily share knowledge and information, and through which he is acknowledged repeatedly as a well-loved authority figure.

Ahlin's (2011) argument that telemedicine democratizes medical knowledge also holds true, as the midwives now have a vehicle through which to ask more questions about the cases they see and to provide feedback to their peers, as the midwives describe how they learn from each other's cases during the focus group. However, I argue that the 'democracy' resulting from this type of teleconsultation is limited, and agree with Duclos (2015) that these systems further reinforce relationships and power hierarchies found within the health system. This is seen

particularly in regards to gender. It is notable that a man who is a doctor runs the platform while nearly all of the participants are women who rank below him in the hierarchical system. Because the doctor is highly respected and regarded, when he created the platform and told the midwives to use it, they did so. When participation eventually dropped off, he admonished them, and they began using it again at his urging. The use of the platform can be seen as performative in order to please the doctor.

Returning to the discussion on uncertainty, telemedicine was occasionally useful, but the platform often times did not help provide clarity. While Vivian's uncertainty about why her client became pregnant while having the implanon device was resolved, the other examples of uncertainty were not. Awoonor-Williams et al.'s (2015) audit of Ghanaian midwives in the Upper East Region stated that midwives only refer cases because of uncertainty 10% of the time. While there are no data regarding the reasons for referral, there is never indication of uncertainty on the referral form. In a hierarchical system like the GHS, where the midwife has the highest level of biomedical knowledge about obstetric care, she might not always want to disclose her uncertainty because it demonstrates a lack of knowledge or understanding and being a repository of specialized knowledge gives her prestige.

A lot of cases do not get posted to the platform. This could be because posting takes too much time, or because a quick referral is more important than taking the time to post. It could also be because midwives want to save face and not demonstrate that they do not know something. While Vivian remained uncertain as to the reason why Azumah miscarried, she did not phrase her post in uncertain

terms regarding the cause. Therefore, perhaps the results of Awoonor-Williams et al.'s (2015) study regarding uncertainty and referral is more nuanced than simply "uncertainty" as the reason for referral. As previously mentioned, protocols allow one to refer without having to admit uncertainty. If you have reached the limit of your capacity or knowledge, you refer to the next level of care. Thus, here there is little room for teleconsultation, as the provider knows the next step to take is to refer, which in the case of an unsure provider, is the safest option for the patient.

Ultimately, these vignettes demonstrate that the work and life of a midwife in rural Ghana is difficult. So, how much does telemedicine really help? While it facilitates better communication and provides learning opportunities, telemedicine does little to alleviate the workload, the stress, or the risk inherent to the work of a midwife. Better infrastructure in the form of roads, referral vehicles, functioning equipment at health facilities and cell network, in addition to increased staff to share the workload burden, would do more to ease the work of a midwife than teleconsultation alone.

Chapter Six
Discussion

The first goal of this research was to describe how telemedicine is being utilized in the Ghana Health Service (GHS) system, particularly for obstetric care. Chapter Four describes in detail how the teleconsultation center (TCC), at least at the time of this study, was hardly utilized at all. The reasons for this were that: 1) districts had not conducted trainings on telemedicine, and therefore much of the workforce is potentially unaware this resource even exists; 2) the TCC was largely understaffed and when nurses did attempt to call in, their calls were not answered, which was a negative reinforcement that led to nurses not wanting to call again; 3) calling the TCC does not make sense hierarchically, as it seems to "overstep" the next level of care (district hospital) and for some health care workers it also means that the person answering the phone has less training than themselves; and 4) calling the TCC goes against protocols, which stipulate referral when a case is beyond your capacity.

How telemedicine is being used for obstetric care was a particularly meaningful finding of this study. When I first went to the TCC to discuss my research, I was told that no one calls in for obstetric cases. Later, when I received the call data for the month of October 2018, the majority of the cases were obstetric-related (10 out of 16 calls), though all were told to refer to the next level of care. Therefore, it appeared that while the TCC was being used for obstetric cases, there was little consultation occurring for how to handle these types of cases; the calls were serving as part of the referral system. However, there was a parallel system of

teleconsultation for obstetric care occurring over WhatsApp in the Labour Ward platform. As detailed in Chapter Five, midwives and doctors provide consultation, advice, follow-up, and general information regarding obstetric patient care through their own private group. While it is useful when reporting referrals, asking questions about non-emergency cases, and learning the results of a case that was referred to the hospital, teleconsultation only alleviates the work of a midwife so much. There are still many instances, particularly emergency cases, that a midwife must handle herself and teleconsultation in its current form is of little help.

The second aim of this dissertation was to explore the complexities of social structures and communication within health systems and how that pertains to technological interventions like telemedicine. As quoted in Chapter Four, a participant explained,

> *If you are my friend and Mr. A is not my friend, if I am to call the two of you to assist me, I think I may call you [first]. If I don't get you, then I will call this person. If we are seeing each other almost every day, we are chatting almost every day, we are having meetings almost every day, that can make a difference.*

Teleconsultation, in essence, is advice one seeks when unsure of how to provide the appropriate medical care to a person in need. This likely is a stressful situation for the caller who is seeking consultation. In any normal scenario, people turn to those they know and trust when seeking advice or guidance. Therefore, it makes sense that in a medical scenario, the same would hold true, just as the quoted participant states above, and especially in a stressful situation. Teleconsultation centers can be created in order to provide counsel for the GHS workforce, but they still might opt to seek advice from people they know first. This is part of the reason the Labour Ward

WhatsApp platform is successful: everyone in the group knows each other and they know and especially trust Doctor. Health systems are comprised of health care workers who are human beings and humans are social. While implementing a technological solution may at the surface level seem to be disparate from the social system, it is not. Telecommunication, in particular, is a relational technology that relies on, builds, and sustains relationships.

Social Systems in Health Care

Often, bureaucratic and technological systems are thought of as just that – bureaucracies and technologies, entities that humans use, but which are not in and of themselves anything more. But in actuality, they are social systems *because* humans utilize them. Much of the work in the STS literature argues that science, technology, and medicine are not value-free, but reflect the values of those who create, utilize, and disseminate them. A similar idea can be applied to the sociality of systems. The idea that health systems are social systems is not in itself new. However, as telemedicine is such a recent innovation, there has been little discussion thus far regarding the inherently social nature of this technology, and the implications of this fact.

Given the nature of the setting in which the midwives and nurses featured in this study work, communication and connection to others is incredibly important. Health workers are providing care in rural areas with limited resources, but it is now easier to discuss cases with a colleague, to inform a receiving facility of a referral, and to request resources such as a vehicle than it was prior to the proliferation of

cell phones. The national GHS teleconsultation system was created because it was known that nurses use their phones in their work, and it was assumed it would be feasible to formalize this type of communication. However, the new system fails to consider the important roles of social networks and hierarchical relations in regards to communication.

Normal work processes and communication mechanisms are demonstrated in the ethnographic vignettes throughout this dissertation. Who a person calls for advice or help, and when, is entirely dependent on the scenario. However, there are several factors that remain constant: the person reaching out contacts someone else who is of equal status and training or higher than themselves, and they contact a person they know and trust. This was demonstrated throughout the research, with distinct differences in the utilization of the TCC and the WhatsApp platform.

Social Technology

The idea that technologies can be social is well-established within the STS literature, but such theories have rarely been used to analyze e-health programs thus far (MacDonald & Diallo, 2019). Telemedicine is being integrated into complex systems with set hierarchies and reinforces authoritative knowledge and power structures. The hierarchies within the health system take on social meaning, which are reflected in the ways people relate and communicate with one another. While the social nature of the app can be seen in the posts on the Labour Ward WhatsApp platform, this tool also demonstrates the ways in which technology is a medium through which social hierarchies and authoritative knowledge are replicated.

Deference is demonstrated for those with higher rank and training, and those in positions of authority. This is seen particularly with Doctor, who disseminates knowledge and maintains his role as an authoritative knowledge holder through the platform. Efforts to formalize a teleconsultation system should not neglect the reason someone calls a particular person in the first place: because she knows him and trusts his authoritative knowledge. In other words, the technology is not as critical as the social relations potentiated by it.

Gender in hierarchies was an aspect seen throughout the research, but particularly within the Labour Ward WhatsApp platform. This was seen in the different perspectives from the midwives and Doctor on the platform. While the midwives and Doctor work together to "domesticate" WhatsApp and discuss how to make the platform best work for their teleconsultation needs (Pols, 2012), ultimately, Doctor, the man with a higher professional and social rank, is the final authority and decision-maker. While access to the technology is equal among genders, it still reinforces traditional gender roles that are present outside of the platform. Thus, telemedicine is being introduced into social systems with delicate balances of power, and those power dynamics are replicated in and dictate the utilization of the systems. Although social relations and dynamics are not always considered when building technical solutions to problems, they are hugely impactful in the results.

The GHS's teleconsultation system ignores social hierarchies and authoritative knowledge in its structure, and its underutilization reflects potential utilizers' inability to untangle social hierarchies and communication norms when

seeking guidance. The cadre of healthcare staff within the GHS navigate systems based on an understanding of the social and cultural norms within the health system. As teleconsultation is a communication technology, it too must conform to these social and cultural norms.

Mitigating Risk

A major justification for the introduction of telemedicine into a resource-poor setting like Ghana is to help mitigate risk. Various reproductive risks were described in detail in Chapters One and Three, and examples of encounters with these risks are detailed in Chapters Four and Five. This research demonstrated that teleconsultation, either through the TCC or WhatsApp, was not mitigating reproductive risk for women in the Upper East Region. As mentioned in Chapter Three, the leading cause of maternal mortality in Ghana is hemorrhage. The ethnographic vignette of a postpartum hemorrhage case at Tiisi from Chapter Four describes what happens during a hemorrhage event, and how there is no time for teleconsultation. Other leading causes of maternal mortality in Ghana, according to the verbal autopsy data from the 2007 maternal mortality survey, were issues like malaria, abortion, and anemia (Asamoah et al., 2011). Malaria and anemia are extremely common in the Upper East Region, and these issues were discussed in various examples throughout this dissertation. However, there is often no need for teleconsultation to address these cases. Nurses and midwives know how to test for these conditions, and how to treat them. Other types of interventions are needed to truly address the causes of these conditions.

This research found no evidence that teleconsultation was reducing any risks to maternal mortality. However, the results indicate that the Labour Ward platform is boosting the morale of the midwife workforce in Bongo District, which in turn can reduce some of their stress and potentially reduce burnout. This also might be a way to help address some of the lingering issues of maltreatment by midwives. Encouragement from others and acknowledgement from a superior can help to keep a midwife motivated, as well as provide reassurance that she is not alone. This comradery through the platform has the potential to indirectly potentially improve the experience for clients, which can also potentially improve the utilization of biomedical facilities. Ultimately, the social nature of the platform has a greater impact on the midwives by boosting their morale than it does to help them mitigate maternal mortality risks.

Is Teleconsultation the Right Solution?

The intended target utilizer of the TCC is the nurse on the periphery who has little training, few resources, and can be faced with emergency situations. When a quick referral to a larger facility or a hospital is unlikely, can teleconsultation be an adequate solution? Perhaps the more important question is, *does it address the right problem?* In order to justify telemedicine, the problem is being phrased in terms of the staff at the periphery not having enough capacity, both in terms of knowledge and resources, to adequately serve the population. However, my research with the midwives, both at Tiisi and via the Labour Ward group, demonstrate that the capacity is largely there, at least for obstetric care. Certain types of cases require the

patient be transferred to a hospital, and the lack of infrastructure makes this difficult and dangerous. Telling someone how to handle a case over the phone may seem like a simple solution to side-step the larger issues of not having good roads, vehicles for transporting patients, and a severe shortage of physicians, but it may not be the right one.

The reason the TCC is not being utilized well is not because the workforce was resisting the technology; there is willingness to incorporate technology into the work, it just needs to be done in the right way. It is also important to remember and recognize how much work it is to be a midwife or a nurse. Midwives receive patients at all hours of the day and have duplicate paperwork that needs to be filled out for every encounter. Anything that is extra work that is not mandatory will likely not be done unless it has an immediate benefit. This was seen in the MoTECH study described in Chapter Four, and in the data where staff said they did not want to call the TCC because it was an extra, unnecessary step to reporting a referral, and when midwives mentioned that they did not have time to type messages on the platform. Similarly, in Chapter Five, Midwife 1 balked at the idea of having to type out feedback on the platform for every referral case. At the present moment, teleconsultation is only being used when it makes sense and it fits into the normal work flow; otherwise, healthcare staff literally have their hands full and will not utilize it.

Future Directions

This research illuminated several avenues for future research. Given the importance of the locally-established Labour Ward Platform in providing professional support, it is important to expand this research to consider other aspects of the platform. Firstly, as this research focused on those who are actively engaged in using the WhatsApp platform, it is also important to understand why some members of the platform are *not* utilizing it. This was not feasible during my research, but is something that should be studied in depth moving forward because understanding the reasons for non-utilization can help to tailor programs to make them more user-friendly in the future. Additionally, while I have speculated that the WhatsApp platform is alleviating stress for the midwives, this observation was drawn from my data analysis. Direct investigation into this would be of value to understand how to strengthen health systems by bolstering workforce morale, as well as be of interest to the anthropology of reproduction literature by further illuminating the experiences of work as a skilled birth attendant. Further in-depth study of the "domestication" of telemedicine by health workers will contribute to the STS literature by providing more empirical evidence for how this process occurs, particularly for this important form of technology that will continue to gain prominence in health care worldwide. Finally, exploring other locally-constructed telemedicine systems would provide an indication of the generalizability of the results found in this research.

Appendices

Appendix 1: Participant Descriptions

Tiisi Health Center

Pseudonym	Gender	Role
Sandra	Female	Midwife
Vivian	Female	Midwife
Esther	Female	Midwife
Vera	Female	Midwife
Alice	Female	Nurse's Assistant
Aisha	Female	Physician's Assistant
Dennis	Male	Psychiatric Nurse
Emmanuel	Male	Enrolled Nurse
Samuel	Male	Enrolled Nurse
John	Male	Enrolled Nurse
Eric	Male	CHO
Jennifer	Female	CHO
Patience	Female	CHO
Ellen	Female	CHO
Janet	Female	CHO
Ibrahim	Male	CHO
Grace	Female	Lab Tech
Doris	Female	Housekeeper/snack vendor

Community Health Officers outside of Tiisi Health Center

Pseudonym	Gender	Role	Location
Barbara	Female	CHO	Tiisi Subdistrict
Peter	Male	CHO	Tiisi Subdistrict
Mariama	Female	CHO	Tiisi Subdistrict
Beatrice	Female	CHO	Tiisi Subdistrict
Ernest	Male	CHO	Tiisi Subdistrict
Richard	Male	CHO	Tiisi Subdistrict
James	Male	CHO	Nabdam District

Ghana Health Service Administrators

Identifier	Level	Gender
Participant 1	District	Female
Participant 2	National	Male
Participant 3	District	Female
Participant 4	National	Male
Participant 5	National	Female
Participant 6	District	Female
Participant 9	National	Male
Participant 10	Regional	Male
Participant 11	District	Male
Participant 12	National	Male
Participant 13	Regional	Male
Participant 14	Regional	Male
Participant 15	District	Male

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