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Designing prenatal m-Health interventions through transmigrants reflection on their pregnancy ecology

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DESIGNING PRENATAL M-HEALTH INTERVENTIONS THROUGH TRANSMIGRANTS REFLECTION ON THEIR PREGNANCY ECOLOGY

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ABSTRACT

AlJaberi, Hana. Ph.D., Purdue University, May 2016. Designing Prenatal m-Health Intervention through Transmigrant's Reflection on their Pregnancy Ecology. Major Professor: James Mohler.

This dissertation presents the findings from three participatory focus group and co-design sessions with Caribbean transmigrant women in the United States. Informed by their focus group discussions regarding their pregnancy experiences in the United States, the participants produced design ideas that reflected on physical, emotional, informational and social gap themes. The purpose of this study was to understand the challenges affecting the women's prenatal wellbeing practices, and to conceive a set of recommendations and opportunities for mHealth technology design to assist with prenatal preventative care and management. The study uses the theoretical concept of pregnancy ecology to identify gaps in prenatal health management, and understand participants' reflection on these gaps through design. Then, the study identifies opportunities for mHealth and HCI research to consider designing tailored interventions to the realities of the expecting immigrant mother, including the role of transnational social support, and embracing the role of entertainment in mental health during pregnancy.

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CHAPTER 1. INTRODUCTION

Mobile telecommunication technologies are the fastest globally penetrating information and communication technology. As of 2011, Asia, Africa, and Latin America are noted as the first, second, and third largest mobile markets (GSMA, 2011a; 2011b). Today's immigrants in the United States use technological advances to seek, establish, and maintain access to "multi-stranded" (Basch, Schiller, & Szanton, 1994, p. 8) social networks and resources not only in the country of settlement, but also in their societies of origin to cope with the "bifocality" (Rouse, 1991, p.15) of their identity brought about by migratory processes (Basch et al., 1994). This phenomenon is known as transnationalism, and immigrants who partake in transnational activities are referred to as transmigrants. Often, the conception of transnationalism is accredited to advances and widespread accessibility of communication technologies (Basch et al., 1994).

On the grounds of the growing mobile phone penetration rates globally (GSMA, 2011a; 2011b), there has been a growing interest in the use of mobile phones to improve accessibility to healthcare (Sloninsky & Mechael, 2008). This has resulted in the birth of the term mobile health (mHealth), which is described as the exploitation and capitalization of mobile technologies as means to support healthcare communication (Istepanian & Lacal, 2003; WHO, 2011). Today, mHealth developers and advocates promise equal access to healthcare services and education to address challenges such as

inadequate numbers of qualified healthcare personnel, inefficient disease surveillance and information reporting systems, treatment compliance, health promotion, preventative care, weak management and distribution of drug inventory, and many more (Kahn, Yang, & Kahn, 2010; Sloninsky & Mechael, 2008).

Advocates of mHealth have called for expanded efforts that explore the implementation of such technology to serve pregnant women. According to the World Health Organization (2012), rendering effective prenatal and postnatal healthcare and educational tools to mothers can significantly reduce child mortality within the first month of birth. The significance of the role of prenatal and maternal care has long been recognized by the United Nations and in 2000 was confirmed under their declaration of the Millennium Development Goals (MDG). The United Nation declared reducing child mortality and improving prenatal and maternal health of low- and middle-income communities around the world as one of the key targets for health stakeholders to conquer and improve (WHO, 2012). Exploring opportunities for mHealth to serve pregnant immigrant women remain unexamined.

1.1 Significance

Caribbean immigrant women face risk of low birth weight at 2.4%, compared to 0.7% for white American women (Pallotto, Collins, & David, 2000). Also, they are susceptible to illnesses such as heart disease, asthma, poor breast health, and illnesses related to sexual intimacy (Brown et al., 2006). Although their native tradition includes healthy foods, many are at risk of chronic type II diabetes for having to improvise their native diet in unhealthy ways when migrating to the United States. Prenatal health is

especially critical for lower-income recent immigrants who face many health-related challenges as they adjust to their new host country. Their health is compromised as it is, and pregnancy only adds to their health vulnerability. Several challenges have been reported and documented in the literature (Brown, Ayo, & Grinter, 2014; Sisley, Hutton, Goodbody, & Brown, 2011). While many are unaware of the benefits associated with preventative care, the unique challenges with this minority group is not knowing the available medical resources to them in the host country. Also, factors including limited medical accessibility due to health insurance, cultural insensitivity by doctors and nurses (Brown et al., 2014), and mental health stigmas (Sisley, Hutton, Louise Goodbody, & Brown, 2011).

Because of these gaps in care, mHealth has the potential to deliver better pregnancy interventions for these women. It can facilitate self-guided support with culture and socioeconomic sensitive information. Surveying the literature on prenatal health suggests that pregnancy is an ideal phase for intervention. These conclusions stem from an understanding that during this critical time in a woman's life, women are open-minded towards health information and are more likely to follow through with healthy behaviors if they were equipped with correct information (Phelan, 2010; Shieh, McDaniel, & Ke, 2009; Szwajcer, Hiddink, Koelen, & van Woerkum, 2007). Pregnant women are devoted to the health of their unborn child, and most believe that this begins with the health of the expecting mother.

1.2 Research Goals

The first goal of this study was to develop a comprehensive understanding of the physical, emotional, informational, and social stressors and challengers in the pregnancy ecology of low-income Caribbean immigrants. For example, it will seek to reveal information sources and challenges to accessing accurate information, and adopting it into day-to-day lifestyle. Another example, it will seek to understand the role local and long distance social ties play in pregnancy behaviors and technology use. The second goal was to propose a set of design recommendations specific to the pregnancy experiences and needs of recent Caribbean immigrants that should be taken into consideration when designing mHealth interventions.

1.3 Summary of Methods

The investigation of the goals and research questions was carried out using a qualitative critical action research study. The study recruited recent Caribbean immigrant women living in South Florida. The data collection procedures used three focus group interviews followed by participatory co-design workshops.

1.4 Research Questions

This dissertation study aspired to answer two research questions. One, what are the health-related ecological gaps affecting lower-income pregnant immigrant women from the Caribbean that are worthy of consideration in mHealth design? Second, what set

of mHealth design recommendations result from the women's reflection on their pregnancy management challenges during co-design workshops?

1.5 Summary

This chapter provided an introduction to this study. The gaps in mHealth literature that contribute to the significance of this study, and the growing body of Human Computer Interaction (HCI) and health research that this study aimed to extend on are discussed in the following chapter. In Chapter 3, the philosophical approach, research design, and data collection and analysis procedures of this study are presented. Additionally, the ethics of this research, and the measures employed for reliability and validity are discussed. Then, Chapter 4 presents the findings from the focus group discussions followed by the findings from the resulting ideas in co-design workshops. Finally, in Chapter 5 a set of design recommendations for prenatal mHealth are proposed along with a discussion of the limitations in this study, proposals for future studies, and concluding remarks.

CHAPTER 2. LITERATURE REVIEW

2.1 Caribbeans in the United States

Many of the assumptions made by Americans regarding immigrants simply do not apply to the Caribbean community in America. Many Caribbeans who come to the U.S. are well-educated, savvy, and older. They speak English well and have substantial social media skills. Nevertheless, of the 3.5 million Caribbean-born immigrants in the U.S. in 2009, 17.2% lived in households that fell below the poverty line (McCabe, 2011). They mostly reside in Florida and New York – about 69% of the group in 2009 was in one of those two locations. About a third of the Caribbeans in the U.S. live in or around New York City. Two out of every five immigrants in Florida are from the Caribbean (McCabe, 2011).

Caribbean-born people in the U.S. tend to have higher English proficiency than other immigrants and they tend to be older. They become naturalized citizens at higher rates than other groups as well. Although there are still people coming without authorization – about 3.2 percent of the unauthorized immigrants in 2009 were from the Caribbean (McCabe, 2011). Caribbean men and women alike were more likely to have above a high school education than other immigrants and they participate in the

workforce at higher rates than native-born men and women. They are here, and they are growing. In 2009, 1.2 million children in the U.S. had at least one Caribbean-born parent (McCabe, 2011).

Overall, the picture of Caribbeans in the U.S. is a complex one; one in which people with some basic skills and intelligence are working hard to become a productive part of the economy while still facing the struggles that all immigrants face. They are a group that sees the U.S. as a place of opportunity for them, but they do not arrive with an easy journey ahead. Consequently, their story becomes the American story in the sense that their success or failure will depend not upon them alone but on what the U.S. is willing to invest in their success. In this sense, the mHealth strategy takes on a substantial role. Caribbean women slightly outnumber men in the U.S. About 1.1 million Caribbean-born people living in America became citizens between 2000 and 2009. Their overall naturalization rate is 55.4%, compared to an overall rate of 43.7% of the foreign-born population in the U.S. (McCabe, 2011). There is clear desire and capacity to become productive members of the American community. The services under the mHealth umbrella should be thought of as a method of encouragement and provision of the resources necessary to help these immigrants make a positive contribution.

Caribbean immigrants are uniquely positioned to take advantage of the technology that is a precondition to using mHealth resources. Overall, they are more proficient with the use of social media than the average native-born American. Ninety-five percent of Caribbean immigrants with mobile phones text, versus 73% of Americans. Sixty-five percent update social media using their phones, versus 59%. Forty-seven percent upload videos and audio and 62% upload photos, versus 22% of Americans, who

do either or both. Among the Caribbeans, women are also more likely to use their phones to update social media – 72% do so, in contrast to 50% of men (Welcoming Center for New Pennsylvanians, 2012).

For Caribbeans who are the most educated and who have the best economic position, there is good reason to believe that research would reveal some patterns of Internet usage similar to that of white, middle-class people, and, therefore, that pregnant women of the same group would also behave similarly. This should not be taken for granted, of course, as there may be cultural or other factors that reduce the use of the technology as anticipated. Nevertheless, it is possible to anticipate some amount of bifurcation among Caribbean-born residents based upon socio-economic status.

Meanwhile, the ground seems fertile for mHealth strategies for pregnant Caribbean women. If they are apt to use social media online, they may be willing to make use of health-related resources as well. At least one study suggests that it would be a tremendous boon to some of the women. The group, who frequented Brooklyn-area beauty salons, was both educated and prone to risky behavior. The group surveyed was 49% U.S.-born African Americans, while 47% were Caribbean born. The group by and large was educated: Ninety-one percent had graduated high school or had higher education than that. Twenty-nine percent were college graduates (Brown et al., 2006). Despite all of that education, though, they persisted in behavior that increased risk of damage to heart and breast health, asthma, and endangered their sexual health. They also exposed themselves to second-hand smoke, engaged in behaviors that exacerbated asthma problems, and neglected prostate health (Brown et al., 2006).

Of course, in the U.S., neglect of health is almost a cultural tradition, so one could argue that these are signs of integration into the cultural mainstream. Nevertheless, the purpose of reviewing this study is to make note of the substantial need for health interventions that might be effective. Combining this data with the cell phone use rates and patterns of behavior noted above, there is reason to believe that an mHealth strategy could make substantial inroads in terms of improving the health outcomes for Caribbean women in the U.S.

Intervening in the lives of Black Caribbeans may have even more resonance, in that they face the double burden of their immigrant status and the pervasive skin-based prejudice prevalent in the United States. Although they may be able to distinguish themselves from native-born African Americans in the first generation, their children will in many cases fully integrate into an ethnic group with a litany of health challenges, among others, that may be easier to tackle during the generation that is displaying some of the behavior patterns of Caribbean immigrants, such as extensive cell phone use (Brown, 2015). To be sure, there will still be challenges – for example, Caribbean men suffer from mental health issues as a result of discrimination (University Herald, 2014). That is all the more reason why it is worthwhile to focus on this substantial group of immigrants to the U.S. and seek out patterns that could improve health outcomes for them. Altogether, there are 1.7 Caribbean-born Black immigrants in the U.S. (Thomas, 2012). Of those, almost 80 percent are fluent in English, meaning that communication-based interventions have fewer barriers than they would with other groups. Overall, about half

of the Caribbeans in the U.S. are Black – and Caribbeans represent about 9% of all immigrants in the U.S. (Anderson, 2015). Improved health outcomes with this group will make a big impact.

In her 2014 analysis of human-computer interaction, Irina Shklovski, along with her research team, observed that immigrants in the 21st century experience separation from their homeland in a different way than they had in the past. What once was a place that would be difficult to contact and which one might even attempt to shed as one arrived and tried to survive in the United States, modern technology and changes in the way people think about culture and immigration mean that there is capacity and interest in staying connected to the homeland. Of course, this also means there is greater pressure to succeed and to send resources back as well, but this has always been a part of the immigrant story to some extent. The new condition of the immigrant is called the interconnected diaspora, and the new relocation is one in which a virtual foot is often left on the soil from which one exited. The links that are maintained to the mother country are many and strong – and made stronger by social media (Shklovski, Vertesi, & Lindtner, 2014). Consequently, hybrid forms of culture are often developed from the experience of living to some virtual degree fully in two places. Cultures merge more fully – and the manifestation of Western culture that often is relied upon to make that connection stay strong, the cell phone and the Internet, become essential tools of the new hybrid culture.

2.1.1 Caribbean Women in America

As mentioned above, there are a number of health problems that uniquely impact Caribbean-American women. Enumerating some of them not only sets the stage for

considering the contours of a Caribbean-oriented health app, but it also makes clear the degree to which health solutions for pregnant Caribbean women are needed. Like African-American mothers, Caribbean-born women experience newborns with very low birth weights (Pallotto et al., 2000). The risk for them of very low birth weight is 2.4 percent, versus 0.7% for white American women. Clearly, promoting healthy choices that would lead to increased nutrition for their unborn children could only help this situation, even if cannot cure it.

This is just the tip of the iceberg. The group of illnesses that women from Brooklyn hair salons were asked about was not a random set. African-American women in general and Caribbean women in particular are disproportionately susceptible to heart disease, asthma, poor breast health, and illnesses related to sexual intimacy. They tend to be exposed to unhealthy conditions that increase the possibility of these illnesses or conditions approaching an illness, such as exposure to secondhand smoke and pressure to make unhealthy eating choices (Brown et al., 2006).

Caribbean women are in a gray area where the health outcomes for themselves and their babies are not as good as those of their white counterparts in the U.S. but are better than those of African Americans born in the U.S. As a result, they are sometimes overlooked as a community at risk, despite such problematic statistics as their stubbornly low birth weights (Pallotto et al., 2000). Studies such as the one led by Howard Cabral reach the accurate but to a degree unfortunate conclusion that their pre-pregnancy nutritional status is often better than that of U.S.-born African-Americans (Cabral, Fried, Levenson, Amaro, & Zuckerman,1990). It is without a doubt true, but nevertheless points out that Caribbean women are not at the nutritional ideal, since they are struggling with

other challenges, such as low birth weights. Although they may have a tradition that includes healthier food choices as part of their native diet, interviews reveal that Caribbean women are ending up with chronic diabetes because they are improvising their native diets in unhealthy ways (Chrystal, 2012). It is a strange "plus" for Caribbean-Americans that, were they able to cook their food in the traditional manner, they would be healthy. Instead, they are getting type II diabetes, and it seems like cold comfort to say they have a rich and healthy food heritage.

Likewise, Caribbeans in American are compared to African-Americans born in the U.S. regarding mental health issues and may be considered less badly off given that they do not have the severity of problems that their Black American-born counterparts do. Neither, it is inferred, are able to do as well as white American, because overall they do not have access to the same resources (Williams et al., 2007).

Another study examines the probability of perinatal depression among Black Caribbeans versus white women in Britain. This study finds that, although incidents of depression are about the same, Caribbeans are less likely to receive treatment for their depression (Edge, Baker, & Rogers, 2004). The report rightly suggests that it points to an inequity in care in the health system in that country.

Another study found that more advanced stages of cervical cancer were found in immigrant Caribbean women than in U.S.-born African-Americans or whites. This pattern was found among patients in a public hospital on Brooklyn (Fruchter, Remy, Burnett, & Boyce, 1986). The differences narrowed and almost disappeared in a nearby university hospital, where the health insurance required entering ensured that people of a minimum socio-economic status attended the hospital.

2.2 Culture in Health Technologies

Several scholars in health communication and mHealth technology design have stressed the necessity of centralizing culture in the design, application, and evaluation of health communication technologies (Cole-Ceesay et al., 2010; Chib, A., 2010; Dutta & Basnyat, 2006; Ford & Yep, 2003). For example, the absent recognition of 'culture' in established and well-known models of health communication led Mohan J. Dutta to put forth the theory of the Culture-Centered Approach to Health Communication (Dutta, 2006). The Culture-Centered Approach to Health Communication is grounded in the view that cultural contexts offer a rich theoretical landscape into understanding the ways in which health seeking behaviors are constructed and mediated in marginalized health communities (Dutta & Basnyat, 2008). When navigating marginalized contexts, this approach rationalizes health seeking behaviors in connection to culture and the lived experiences of those participating in the culture instead of articulating it from a universal lens (Dutta & Basnyat, 2008). Such theoretical underpinnings are often ignored in mHealth technology design and implementation for marginalized settings (Mechael, 2009). Thus, this study contributed by taking into account the role culture plays in health technology designs particularly for pregnant immigrant women.

2.3 Pregnancy Ecology and mHealth Design

Medical and information gaps in care lead immigrant women to tap into informal resources of information (Brown et al, 2014; Staiti, Hurley, & Katz, 2006). This introduces incorrect, conflicting, and misguided information (Peyton, T., Poole, E.,

Reddy, M., Kraschnewski, J., & Chuang, C., 2014). mHealth has the potential to deliver better pregnancy interventions to underrepresented women. It can facilitate personalized information through self-guided support with culture and socioeconomic sensitive information. This can be challenging through traditional means such as pamphlets and brochures, which are impersonal and often easily lost or forgotten (Kraschnewski et al., 2013; Peyton et al., 2014). Also, it can ensure the delivery of accurate and timely information along with support capabilities for better pregnancy management. The literature on mHealth technologies is saturated with studies investigating contexts in developing countries. As such, WHO encourages efforts to be extended to the ignored context of minorities in developed countries (WHO, 2011). Thus, this study aimed to contribute to filling this gap by focusing on low-income pregnant Caribbean immigrant women in the USA.

Existing pregnancy mHealth applications focus on topics surrounding the birthing event such as fetal development, countdowns to delivery, generic nutritional tips, and birthing complications (Peyton et al., 2014). Additionally, several models of mHealth, for example, use text messaging prompts (Parker, Dmitrieva, Frolov, & Gazmararian, 2012), birthing chat rooms (Peyton et al., 2014), and activity tracking with extensive input commands (Haapala, Barengo, Biggs, Surakka, & Manninen, 2009). However, the impact of body changes and unpredictable energy levels during pregnancy might not be represented well through traditional designs of mHealth activity promoting tools. Because these existing applications do not focus on the needs of a specific group of pregnant women, this study added to the mHealth space by providing an alternative design approach to address the limitations of existing undesirable systems.

The relationship between health outcomes for a pregnant women and technology in part through the creation of the term *pregnancy ecology* (Peyton et al., 2014) seeks to create a nuanced understanding of the needs of pregnant women, who are often reduced to a series of data points and objectified as the adult carrying a baby to term. The term was specifically formed to emphasize the uniqueness of every pregnancy. This approach pushes to the surface the consideration of issues including physical, emotional, information, and social care to shed light into a new perspective for the typical topics of diet, activity, and weight tracking in pregnancy management (Peyton et al., 2014). The pregnancy ecology attempts to make clear the real value technologies can provide in aiding women with pregnancy health related issues.

2.4 Pro-Social Health Technology

Several technologies promote health initiatives through social motivation (Consolvo, Everitt, & Landay, 2006; Lin, Mamykina, Lindtner, Delajoux, & Strub, 2006; Mueller, O'Brian, & Thorogood, 2007) or social pressure (Consolvo et al., 2006). An example includes applications that publish the user's physical activity performances to their social media profile for others to see. This exposure motivates users through online encouragement by others or fear of being portrayed as an under achiever.

Other forms of virtual support include online health communities. These provide a venue for social sharing, support, and health empowerment (Grimes, Bednar, Bolter, & Grinter, 2008). In addressing poor mental health in victims of domestic abuse among immigrant women in the UK, Clarke, Wright, and McCarthy (2012) introduce digital technology means of photosharing and storytelling to promote coping and mental

wellness through peer support. Another example is a voice phone application facilitating social sharing of knowledge about healthy eating from personal experiences in low-income African American communities (Grimes et al., 2008). Engaging in online communities can help users feel empowered with information so that they are better prepared to make better health decisions when interacting with medical professionals, such as the case with individuals dealing with physical injuries (Maloney-Krichmar & Preece, 2005).

Because of the small number of studies exploring health-related technology tools for immigrant women, this study aims to contribute in filling this gap. This study extends social health technology research by examining mHealth as a social technology providing pregnant immigrant women with health-related social sharing and support capabilities.

2.4.1 Immigrant Women and Transnational Societies

Transnational social support within the context of immigrants is about accessing social support resources in the receiving country while also maintaining existing ties in the origin country (Basch et al., 1994). The conception of this term was accredited to advances in communication technologies such as the use of the Internet and cellular phone capabilities (Basch et al., 1994). There is literature advocating for online health-related social sharing across borders (Maloney et al., 2005; Salem, Bogat, & Reid, 1997) connecting people across different parts of the world. In contrast, there is other literature advocating for virtual mobilization of local communities with shared issues (Brown et al., 2014; Grimes et al., 2008), in a term referred to as “community computing” (Kavanaugh, Carroll, Rosson, Zen, & Reese, 2005). This study examines transnational health-related

social sharing behaviors during pregnancy for low-income Caribbean immigrant women that could contribute to proposing better design solutions for prenatal mHealth.

2.5 Summary

This chapter presented gaps in the literature landscape of pregnancy mHealth tools. Existing work focused heavily on contexts within developing countries ignoring minorities in developed nations. Also, existing applications failed to directly address the specific needs of pregnant women. Given the lack of studies exploring health-related technologies for immigrant women, and based on the gaps discussed and the HCI's literature growing interest in the role culture and social relationships play in health technologies, it was only appropriate for this study to research questions situated within the pregnancy context of immigrant women in the USA as a complex ecology. What are the health-related ecological gaps affecting lower-income pregnant immigrant women from the Caribbean that are worthy of consideration in mHealth design? What set of mHealth design recommendations result from the women's reflection on their pregnancy management challenges during co-design workshops? These questions encapsulate the focus of this study. The following chapter explains the choice of methods used in this study to collect and report data that contributed to addressing these research questions.

CHAPTER 3. METHODOLOGY

3.1 Study Overview

A qualitative study grounded on critical theory action research methodology approach was set out to accomplish the goal of uncovering health-related stressors and challenges in the pregnancy ecology of lower-income recent immigrant women from the Caribbean. The concluded understandings proposed a set of design recommendations to improve upon the limitations of existing undesirable mHealth tools. In this dissertation, the researcher conducted three semi-structured focus group interviews and co-design sessions with Caribbean immigrant women to put forth a set of mHealth design recommendations based on the women's reflection on their pregnancy management challenges. The recruitment and administration of these focus group interviews occurred over the course of six months (April – September 2015) in south Florida (Palm Beach, Broward, and Miami-Dade Counties).

3.2 Theoretical Framework

The research paradigm that underpins the methods used in this dissertation is the critical theory paradigm. The critical theory paradigm enables this study to employ frameworks that can produce rich data informed by two processes. The processes involve

analyzing the interpretation of data collected and then suggesting and presenting an action agenda for reform recommendations (Guba, & Lincoln, 1994).

Participatory approaches under the critical paradigm allows those who are marginalized, absent, or silenced to voice their ignored realities, experiences, perceptions, needs, and capabilities (Dutta, 2006; Ford & Yep, 2003). Participatory frameworks can engage key members in the design and application of appropriate m-Health solutions in a liberating process to ensure the inclusion of all those marginalized by adopting a cultural and value approach to generating theory (Dutta, 2006; Ford & Yep, 2003). Stakeholders participating in the process of design contribute strategic design decisions with the barriers they face daily in mind (Campbell & Jovchelovitch, 2000). This framework provides the researcher with the opportunity to seek immediate, valuable input from stakeholders in the design of mHealth technologies (Andria, et al., 2015).

3.3 Research Design

The following section discusses the study's choice of methods including focus group interviews and co-design sessions. Then, it covers the characteristics of the participants recruited and sampling strategies. Lastly, recruitment procedures and the resulting sample size are explained.

3.3.1 Methods

Each session of the data collection procedure was divided into two phases. In phase one, the Caribbean immigrant women engaged in focus group interviews. Then,

phase two employed participatory co-design workshops. This section discusses the choice of methods used in both phases and why.

3.3.1.1 Phase 1: Focus Group Interviews

Initially, this study employed one-on-one, semi-structured interviews. However, this proved extremely challenging and problematic in recruiting some of these immigrant women. Some women were intimidated by being interviewed alone. Also, convenience for the researcher was a factor because one-on-one interviews were extremely time consuming due incidents of participants not attending or rescheduling on the agreed date of the interview. Therefore, the study employed focus group interviews instead of one-on-one interviews to add a social aspect motivator for these women to participate. That way these women could have the option to bring a friend who is eligible to motivate them to be less intimidated, or to meet new women.

Because getting these busy participants to keep their interview appointment was challenging, focus groups enabled the researcher to get more participants in at one time and enforce a take it or loose it strategy. The author has also uncovered relevant literature (Brown et al., 2014; Peyton et al., 2014; Wyche, & Grinter, 2012; Wyche, & Chetty, 2013) that was used as a reference template to ground the study's methods during amendments. In this case, focus groups were used instead of one-on-one interviews to provide the same initial benefits with the added advantage of promoting reflection among women for richer data (Kamberelis & Dimitriadis, 2013).

The focus group method in phase one was employed as a warm up activity to help participants come up with themes to reflect on during the co-design workshop task in

phase two. A strategy employed in formulating the focus group questions was to probe participants to talk about their values indirectly. The reason being is that more often than not "people have concepts about many aspects of the topic on which they cannot directly reflect" (Friedman, Kahn, & Borning, 2008, p. 93). This was achieved by asking participants about common everyday events, obstacles, and behaviors in which they engage (Kahn, 1999). This is also why using focus group to promote reflection among participants was useful.

According to Baxter (2011), individuals in any type of relationship "speak culture" in the conversations they carry privately among them or publicly when they speak to others about these relationships. We tend to involve culture and social codes and values in our conversations to help others understand these relationships. Therefore, social and interpersonal questions were added to help extract contextual and cultural codes and also help identify the important relationships in an immigrant woman's pregnancy.

Also, the topic of technology was added to the line of questions in phase one and made the focus of activities in phase two for the following reasons. Technological tools are not just mediating platforms that help us accomplish different tasks or needs in this world. Instead, it structures the lives, perceptions, needs, and values of individuals who own and use them as participants of a society (Yoo, Huldtgren, Woelfer, Hendry, & Friedman, 2013). In turn, the form and function of technological tools can help us gain a front row seat into understanding what these women care about.

3.3.1.2 Phase 2: Co-design Workshops

The study adopted a participatory co-design framework in phase two (Yoo et al., 2013). Co-design is a creative collaborative activity between the designer and the end users who are not design experts throughout the design process (Sanders & Stappers, 2008). Co-design was founded on the practices of participatory design and as an extension to user-centered design (Sanders & Stappers, 2008). However, it is crucial to illustrate the differences between co-design and user-centered design to understand the rationale of methods used in this study. In short, the difference between the two lies on the changing roles of the key players in the design process. In user-centered design, the researcher assumes the role of the design expert, while participants take on a passive role. In this case, participants are contributors who are observed while performing specific tasks or are interviewed in order to contribute opinions about design ideas that were developed by others (Sanders & Stappers, 2008). In contrast, the end user takes on the expert role in ideation and conceptualization in co-design spaces while the researcher plays a supportive role in that they provide a facilitating platform for the participants to engage in design and reflection.

The added value of engaging participants in design workshops was to understand how they interpret their health and lifestyle in relation to cultural practices, relationships, economies, daily life, and even the food they eat. The value of the resulting designs is not in whether they are good or bad, but in whether they provide a comprehensive picture of who the immigrant women are, how to help them, and how to effectively deliver information to them.

3.3.2 Participants

Participants were recruited using criterion-sampling strategy (Patton, 2001). The purpose of employing criterion-sampling strategy was to include cases that exhibit predetermined criteria that were considered necessary to meet the goals of this research study (Patton, 2001). Furthermore, Patton (2001) adds that the rationale behind this sampling strategy is to understand those cases that exhibit potential to be "information rich" (p.238) in order to uncover strengths and weaknesses that can be considered "targets of opportunity" (p. 238) for quality improvement of programs, systems, products, and so on.

There are shared characteristics among Caribbean immigrant women. So, rather than focus on an individual Caribbean country, the researcher allowed flexibility with participants' country of origin. Expanding participant recruitment to all Caribbean women and all of south Florida provides greater opportunities for recruiting a sufficient number of participants with such specific criteria and hard to access population.

Participants were different in terms of how long they have been living in the United States, their educational background, and employment. Participants were not asked directly about these questions, but the answers to these demographic questions were volunteered during recruitment and focus group interviews. The researcher decided not to directly collect demographic information in order to not alienate the female participants and to make them feel protected.

Despite their differences, the participants shared several characteristics that ultimately were the deciding factor for eligibility and enrollment in this study. All participants came from low-income status and are living in south Florida. The lower-

income participants in this study were employed in hourly paid jobs with minimum wage pay. Also, they were all able to communicate in English. In addition, they had at least one full-term pregnancy between the ages of 18 and 30, and within the last five years in the United States. Participants were not pregnant at the time of this study because the researcher determined that it was not a necessary criterion to achieve the goals of this study. The deciding factor on this particular age group was that pregnancy medical complications are outside the scope of this study. Older mothers are prone to pregnancy complications especially as they reach the age of 35 (Joseph et al., 2005). Finally, all participants were familiar with basic technologies such as the use of cell phones and the Internet. However, the majority exceeded that basic requirement, as most were regular users of mobile gaming, video chat applications, and social media.

3.3.3 Recruitment Procedures

The majority of participants were enrolled in this study by snowball sampling (Patton, 2001). Over the course of almost two years (2014 and 2015) the author lived between Palm Beach and Miami-Dade counties and built connections with local workers in grocery stores, hotels, and Caribbean restaurants and sometimes through mutual friends there. Some of these connections were nurtured on a daily basis whether grocery shopping, dining, or staying at different hotels or residences with enjoyable cultural conversations. These later became informal channels that the researcher was able to recruit participants through. After several amendments to this study's methodology, the researcher began official recruitment through these connections in April 2015. In addition, several flyers were hung at college campuses and grocery store posting boards.

3.3.4 Sample Size

Nearly all the participants came through informal channels, rather than formal organizational channels such as healthy mothers, healthy babies. The workers, who nominated participants for this study, got to see and know the researcher daily. That connection was harder to build through formal channels by recruitment emails or by pitching to a person you just met and had one shot at convincing them to join the study. It was very challenging to recruit these women for a technology research study. Men displayed more interest and approachability even though they were not being recruited for this study. Therefore, the resulting sample size of 12 women depended on the turn out of the combination of snowball and criterion sampling. The researcher's ideal sample size would have been between 16 and 24 women based on previous similar research (Brown et al., 2014; Peyton et al., 2014), an equivalent of one more focus group and design session. Due to time constraints and the emergence of rich data contributing towards answering the research questions, however, the researcher felt confident in presenting the study's findings in the following two chapters.

3.4 Deployment

This section details how the data was collected, and then explains the analysis tools used to arrive at the findings discussed in the following chapter. Then, it outlines how the study addressed issues of confidentiality for this vulnerable population. Finally, it discusses how the study's methods set out to accurately and reliably answer the research questions.

3.4.1 Data Collection Procedures

One of the two hour sessions took place in a conference room of a public library in West Palm Beach, FL. The two remaining sessions took place on a quiet beach in Surfside, FL. This is an unpopulated beach for most days of the week. These locations were chosen because of proximity to where some of the participants worked.

Phase one of the focus group interviews took about 30 minutes to complete. The participants were asked to reflect on their pregnancy experiences as immigrants related to the following keywords: pregnancy, relationships, and technology. Within these categories, add-on probing questions were asked when needed. Participants were asked to discuss what it takes to have a healthy pregnancy, what they found challenging, and where they obtained their pregnancy information. Also, they spoke of the important relationships influencing their pregnancy understandings. Finally, they discussed the technologies they used during pregnancy, and the technologies they used to interact with relationships affecting their pregnancy. Also, the session involved extensively probing each participant's reasoning for certain actions and perceptions. For example, probes such as *why* or *how* helped draw out information about a specific value or a value conflict by engaging their reasoning about the topics being discussed (Friedman et al., 2008). The probes under each topic were placed or omitted to strategically allow for the discussion among the participants to develop organically. The role of the researcher was to keep the discussions from steering into irrelevant directions.

Phase two of the co-design workshop took about 50 minutes to complete. To ensure equal participation by each member, the researcher divided the focus groups into smaller teams of two members each in phase two. The researcher reassured participants

that no design is considered right or wrong. They were reminded that this activity is not to test their sketching skills. So, the researcher demonstrated plain and simple examples of how to sketch ideas (Brown et al., 2014). This demonstrated what the expectations of their sketching skills were in order to encourage participation by those who might be intimated. First, participants were asked to work with their partner to come up with bad design ideas for technologies they used in the past. This served as an inspiration to help them come up with what they think represents a good mHealth design solution. After completing their sketches, each group was asked to present their designs and then exchange them with the other team. After exchanging, each team was asked to present their critique and revisions to the other team's design. This involved discussing likes, dislikes, limitations, and improvements. During that time, an open discussion by all participants was encouraged as well.

3.4.2 Data Analysis Procedures

The unit of analysis in phase one was the individual and their cultural social system that might be affected by an mHealth technology one way or the other (Friedman et al., 2008). On the other hand, the unit of analysis in phase two was the technology itself (Friedman et al., 2008). The researcher transcribed both phases one and two immediately following each session, and an initial set of codes was developed. At that time, each transcription was supplemented with notes detailing the researcher's initial reflections on possible emerging themes.

Transcripts of the focus groups and design sessions including the design sketches were reviewed, compared, and coded using inductive constant comparative method

(Maykut & Morehouse, 2002; Seidman, 2005; Strauss & Glaser; 1967), and then coded using an iterative coding process. Inductive coding was used to compress and summarize the large and diverse raw data from the focus groups and design sessions into key themes that emerged from the data itself as opposed to being implied beforehand.

Within each transcript session, the researcher used tentative short descriptive codes to describe excerpts of text. The process of rereading the transcripts and refining the descriptive codes was repeated several times. As low level themes emerged, the researcher consulted with past literature on pregnancy, HCI and transnational studies (Brown et al., 2014; Peyton et al., 2014; Wyche & Grinter, 2012; Wyche & Chetty, 2013) to help make sense of the data collected. Then, the researcher tried to establish connections between the low level themes that emerged. Later, these themes were combined under a broader theme. For example, in chapter four, the low level themes such as family separation, abandonment, busy lifestyle and energy management, isolation and body image were combined together as subthemes to the broader category of physical and emotional gaps as the headline theme.

3.4.3 Ethics

The researcher took several precautions to protect the identity of the participants. Each focus group session took place in a secure and private location, where no one could hear the interviews. The consent forms are the only connection the participant has to the research. However, these consent forms do not tie any of the participants to any specific audio transcription. At the beginning of each focus group session, participants were asked to pick a fictitious name by which the moderator and other participants can use to

communicate with them while the audio recordings are in effect. Each recording was destroyed after being transcribed. All transcriptions did not include any personally identifiable information including the fictitious name they used in the session. Instead, participants are addressed using the session number, followed by the phase number, and then a number between 1 and 4 that was assigned for each participant within their specific session. For example, participant 2.1.3 references a participant assigned the number 3 in the second focus group and design session conducted. The second digit reference whether the quote was mentioned during phase one or phase two of that session.

All recordings were destroyed after transcription. While audio files awaited transcriptions, there was only a single copy in an encrypted password protected file of the interview collector portable hard drive. All transcriptions and a rough draft of chosen quotes, paraphrased materials, and analysis were made available to the participants for review. Therefore, participants were given an opportunity to clarify any misrepresentation, and approve of the accuracy of the data.

3.4.4 Validity and Reliability

The researcher sought to achieve validity and reliability through the process of triangulation (Patton, 1999). Combining focus group interviews with design workshops, the researcher was able to produce rich and comprehensive data. The designs resulted from participants reflecting on their own stories about personal experiences and the stories they shared with each other during phase one.

3.5 Summary

This study adopted a qualitative participatory action research framework. Its objectives were best qualified for contributing to the goals in answering the research questions. The study enrolled low-income Caribbean immigrant women living in south Florida. The data was collected using three focus groups and participatory co-design workshops over a period of six months. Then, data was analyzed using an inductive constant comparative method and an iterative coding process.

CHAPTER 4. RESULTS

Per WHO recommendations, prenatal health technology interventions should be sensitive to the demographic, social, cultural, and economic players influencing health behavior and adoption (WHO, 2011). In particular, pregnancy is a phenomenon that has been described by women as unique to the individual, and the variability can be attributed to different social, cultural, and economic factors (Briggs, Adams, Fallahkhar, Abowd, & Arriaga, 2012; Peyton et al., 2014; Phelan, S., 2010).

As we take this into consideration within the study's analysis, the findings are mapped into a structuring concept introduced in a relevant study as the *pregnancy ecology* (Peyton et al., 2014). *Ecology* is a "changeable ecosystem" (Peyton et al., 2014) often mentioned in fields of biology, healthcare, and HCI research (Peyton et al., 2014). An *ecological description* attempts to reveal how a context, its stakeholders, and information interact and influence one another (Peyton et al., 2014). Pregnancy ecology is a term that was arrived at by Peyton et al. (2014) in their study that set out to understand lower-income American women perceptions regarding pregnancy health management to establish recommendations for mHealth design. The findings in this study as an extension to this concept represent

ecological gaps in perceived needs by lower income immigrant pregnant women. Additionally, they represent how these women perceive these ecological gaps in technological contexts to help manage pregnancy health.

4.1 Transmigrant Pregnancy Ecology

As such, phase one of the focus group discussions sought to understand the participants as individuals and their cultural and social systems that might be affected by an mHealth technology one way or the other. Challenges faced by prenatal low-income women have been discussed in past literature (Peyton et al., 2014), and the many challenges faced by low-income female immigrants have been noted in past literature as well (Brown et al., 2014). However, the challenges reported by the women in this study's focus group discussions were situated within the pregnancy experiences of low-income recent transmigrant women. Therefore, the following results help establish the context for the findings from the design ideas produced in phase two workshop.

4.1.1 Emotional and Physical Gaps

This section aims to understand the emotional and physical stressors and the gaps in existing prenatal wellness systems influencing the immigrant pregnant woman's ability to engage in health promoting behaviors.

4.1.1.1 Family Separation

Acclimating to a new country during pregnancy is challenging because of the absence of family and social support system to lift some of the burdens during this time. The participants described pregnancy to be a family affair: “The pregnant journey for me is about family, the family connection. With mother, sisters, cousin friends, and friends. We talk about it, we plan it together, we make decisions together, you need each other” (participant 2.1.3). Therefore, the women endured emotional stress during pregnancy triggered by homesickness: “I am homesick when pregnant, I need a flavor of home there” (participant 2.1.2). Consequently, they seek out video chat and group text messaging tools during pregnancy to connect with family in order to assist with long-distance emotional support:

> I always communicate with my mom when pregnant, more than the usual. She stays in my country. So, its hard to talk on phone whenever I like. But, she knows how to use Internet now, we use Whatsapp and Skype whenever we can. (participant 1.1.3)

Hence, a lot of women did not like the content in existing apps because it seemed to focus on the emotional connection between the expecting mother and her unborn child. This is problematic; as for the participants such content seemed irrelevant. In expressing why they were not the intended match for existing pregnancy apps, one participant argued that these were mostly designed for American women who might relate to pregnancy differently:

> Its good for them maybe because you find some cute things like special dates in pregnancy, when your baby gets fingers and whatever, kicks or what that kick means. For some woman, maybe pregnant is hard, so maybe it can help you connect with emotion with your baby that you don't know him or her. It can make it more fun when you are feeling not so good, your body hurts. I'm thinking, maybe... The pregnant journey for me is about family, the family connection. With mother, sisters, cousin friends, and friends. We talk about it, we plan it together, we make decisions together, you need each other. I'm too busy with that side of things, making memories. (participant 2.1.3)

4.1.1.2 Abandonment

An additional theme that caused further stress and fatigue during pregnancy for some women was tensions between the expecting mother and her significant other. Migration is a challenging time for both, which is aggravated further during pregnancy hindering some of the women from participating in healthy behaviors for the mind and body. According to the study's participants, pregnancy is celebrated among female members in Caribbean cultures. The mother and sisters unite to help the expecting mother. "Men back home not his business you are pregnant. Bring your mama over to help you" (participant 2.1.3). While this dynamic is the norm in their home country, separation from the family support system post migration imposed lifestyle changes that require the expecting father to adapt and contribute. When that does not happen, participants are left feeling abandoned and neglected:

> My husband like a ghost. He drink his beer and watch the tv without lifting na finger to help. Typical man... he can't be bothered. I don't need him anyway. What a man know? Na cook, na clean, na watch his own children to help me. (participant 3.1.1)

The resulting emotional stress and added burdens on her time leaves the pregnant woman without the right frame of mind to pursue available prenatal resources and good dietary and fitness behaviors.

However, participants with a supportive and understanding significant other found the migratory transition during pregnancy to be an easier process. A supportive significant other is one who provides support by predicting their mood and taking care of house chores so that they may rest, have time alone, or have time to pursue health activities:

> My husband know when I am pregnant is his turn to get the girls ready in the morning for school. Its more for him because if I get me time I am in better mood because when you pregnant you know you can loose it sometimes in the head. (participant 2.1.2)

When reviewing the findings from the design workshops in the second half of this chapter, the resulting designs will reveal the women's desire to have these relationships supported in pregnancy management mHealth tools. Therefore, a critical analysis will be reserved for discussion in the following chapter.

4.1.1.3 Busy Lifestyle and Energy Management

The women's migratory circumstances imposed lifestyle changes and extended responsibilities. These included limited financial resources, changing roles in the household, and feelings of abandonment by significant other. Thus, some struggled with fatigue due to stress and demanding responsibilities during pregnancy: "I heard about exercising but my feet hurt too much after work and then I have to cook and clean. My sister helps but I'm just so tired!" (participant 3.1.3). Despite struggling with energy management during pregnancy, very few women recognized the benefits of exercising to improve energy and stress levels:

> I also like walking and squatting everyday when I am pregnant. Sometimes I do it first thing in the morning before I go to work, gives me good energy. Or before sun go down after work. Helps me with stress and give me some energy to cook and spend time with my family before bed. Trust me when you give birth it so much easier. (participant 2.1.2)

However, some expressed that it was challenging to stay active because of their demanding busy schedule:

> Think about it. Some of us might have two jobs. This city is not made for walking. Back home you walk a lot to get from a to b. But here if you take the bus, commute can be more than one hour, you sit on your ass. (participant 1.1.1)

Also, another participant added: "You have no time to exercise, good luck with that" (participant 1.1.2).

4.1.1.4 Isolation and Body Image

Variable energy and fatigue during pregnancy led some participants to feel isolated and bored during pregnancy:

> Personally, I find it challenge to do anything fun. My husband and I are always trying to be active and socialize. The problem is that I just don't have very much energy. My husband tries to make up exciting things to do at home but I get so bored being cooped up. And don't get me started on finding flattering outfit to wear! (participant 3.1.4)

Equally, the changing pregnant body led some participants to be anti-social during pregnancy:

> Well, I love salsa nights, but I can't go dancing when I am pregnant its not cute. I don't go anywhere because I don't have anything that is cute to fit. I don't like buying pregnant cloths because your body changes and you have to spend a lot of money to keep up. (participant 1.1.4)

In response, some participants found comfort in using gaming entertainment technologies: "I play Candy Crush, is good when you stressed. It help your brain work again" (participant 2.1.4). Also, some found lurking around social media sites as an entertainment strategy: "I be addicted to finding out what's goin on! I love lookin at the pictures and tweets while I'm sittin at home fat and lazy!" (participant 3.1.3). Surprisingly, few participants found lurking around social media to be a motivating strategy to engage in better prenatal health and wellness behaviors: "I also sometimes go online and look for pregnant women pictures like Instagram and Pinterest, who dress up and workout, so I can be motivated" (participant 1.1.2). Also, some found comfort in

connecting with family and friends by posting “pregnant selfies” (participant1.1.2) to their mobile group messages or social media:

> I think I look better in pictures. You can use filters and if you are smart with how you pose, you will look sexy. You have more curves, ... So, I have a chance to celebrate my pregnancy. I can also say that I like when people like my pictures or put a comment things that I am glowing or say other nice things and it makes my day better because then I feel better about myself. It’s hard when your body is changing and you are worrying about it. (participant 1.1.2)

However, some were skeptical and advised caution of developing unrealistic pregnant body goals because of the idea that every pregnant body is different: ”Every pregnant body is different I think. The last thing you want is to try and have unreal expectations of your body just because someone else can” (participant 1.1.4). Instead, they were receptive to a representation of realistic physical struggles like a swollen feet and face: “I will feel better seeing another people going through depressing things like me” (participant 1.1.3).

4.1.2 Information Access Gaps

This section discusses the participants’ perceived access challenges to prenatal information as a result of their migratory lifestyle.

4.1.2.1 Patient-Healthcare System Relationship

As mentioned in Chapter two, women don’t have the first medical visit until between eight to 13 weeks into their pregnancy (Peyton et al., 2014). This is a long time,

creating an imbalance between information need and provision (Peyton et al., 2014). Immigrant women did not initiate prenatal visits because of additional access challenges including the cost of healthcare, lack of health insurance, or its limitations (Brown et al., 2014). Additionally, the study's participants expressed distrust in their patient-healthcare system relationship. For example, some participants complained about being rushed during hospital visits, and described doctors as impersonal and nurses as rude and impatient: "Who else I am supposed to ask? I ask the nurse at the clinic and she turn her nose up at me. The doctor don speak in a language I understand then push me out" (participant 3.1.1). Others accused the healthcare system of being a scam because of overused and unnecessary tests and described prenatal health as overrated:

> You coming here, you want to be part of the modern life. Is a hustle mama. They tell you all these things you need that you don't need, or something wrong with you to charge you for tests you don't need. (Participant 2.1.2)

Also, women were dissatisfied with how healthcare professionals handle their prenatal questions by handing them pamphlets and flyers that they referred to as "junk" (participant 1.2.2.):

> By the time I get home, you know, I already remove the brochure from my mind. By the time I get home, it is part of the trash if I remember that is somewhere. Mostly all wrinkled in my handbag. (participant 1.2.1.)

4.1.2.2 Unreliable Alternative Information Sources

As the participants felt abandoned by medical professionals to deliver their information needs, the women tapped into informal resources of prenatal care through online search engines, family members, and mom friends.

Online search engines such as Google provided a platform for self-guided help: “In my second pregnancy I was smart. I go to library every Saturday. I finish work early and library right there by my work. Is free. I Google all questions I have” (participant 2.1.4). Google also provided a discreet element for individual and private use: “Sometimes some of the questions you have is embarrassing to ask your mom or doctors. So I just go on Google” (participant 1.1.2). Even though helpful, some women found that online search engines yield at times conflicting and overwhelming information:

> Google is my technology friend when I am pregnant. I like understanding things about myself. But, many times I get very stressed because there is too many opinions to choose from. Or sometimes the language is very medical, hard to understand. I just want something simple to understand right away. (participant 1.1.3)

Because of these disqualifying characteristics of search engines in addition to a clinic’s impersonal methods of providing information, participants turned to family members and their social circles for help: “My mom and my sisters. We all have children so we talk about it all the time and we share advice when anyone is pregnant” (participant 1.1.4). However, it is through strong family bonds and influential social circles that discourses of folk knowledge and misconceptions are passed down and around:

> I love my mom, I don't know what I would do without her ever especially when I get pregnant. But, just there are some times she really get on my nerve and stress me out because she still old school, like the thinking. (participant 2.1.1)

4.1.2.2.1 Misconceptions and Folk Knowledge

During the focus group interviews, there were debates over several circulating prenatal guidelines. For example, there was a collective agreement among participants that deemed diet as one of the pillars to a successful pregnancy. However, there was confusion and debate about appropriate diet and fitness guidelines for pregnancy. One major debate was the idea of eating for two without accountability. "You eat for the baby and for you. Right now to be anorexic and worry too much about looking like supermodel better wait" (participant 1.1.3). Another participant objected: "You should eat your craving but in moderation. You should not want to be skinny of course, but you don't just eat everything like you never going to have cake again. No, I am sorry, not good obviously" (participant 1.1.2). Some women believed that such control could lead to a birthmark deformity, and therefore the expecting mother must submit to the demands of her pregnant body:

> If you don't eat what you crave, your baby will have the blue with green marks somewhere in the body... I have cousins like that because my aunt man didn't eat what she was craving. You don't want your baby to live like that, its not good. (participant 1.1.1)

Also, there was debate over appropriate and safe levels of exercise. Several participants were not into the idea of engaging in exercises once the physical appearances of pregnancy started to show: “walking is very good but not exercise especially when you start to show. You need enough rest and sleep” (participant 2.1.1). But, when one participant expressed approval over the benefits of fitness during pregnancy:

> People say is not good to exercise when you start to show. Before you show is ok? Really? I use to think the same but walks ok only. But you have all celebrities exercise when pregnant, so I am curious now ok? I Googled, and find out it is good for you. It will make your mood better, and delivery of your baby so much easier. (participant 1.1.4)

Another participant interjected with sarcastic disapproval: “So you are one of the crazy Instagram pregnant woman with six abs” (participant 1.1.3).

And then, there were so many culturally and socially informed health tales during the focus group discussions. One participant recalled an encounter with her mother:

> When she came to see me first time I was pregnant, she never been to our apartment before, right? She freaking because the floors are tile, naaa you can’t walk inside your house without shoes because having bare foot on the tile hurt the baby. Actually, the bedrooms she thought were hardwood so can’t walk on either. But, ma these are, you know what you call them, you know, laminate, right? Yea yeah man laminate. I’m just dying laughing, she don’t know the difference. (participant 2.1.1)

And another: “My mom even tell me to cook the meat rare because the blood help the baby grow. What?! Eat anything red like red fruits because it is good blood for the baby”

(participant 2.1.4). Some acknowledged not knowing what was a fact and what was a myth. “I believe when people tell me things like that” (participant 2.1.3)

4.1.2.3 Generic and Impersonal Information

The participants expressed dislike for generic pregnancy print, web, and mobile applications that focus mostly on the unborn child and the birthing event versus meeting the health and wellbeing needs of the expecting mother:

> Most apps about the baby. But, what about me? Even when is about the baby, is out of touch, you know. I am homesick when pregnant, I need a flavor of home there. Otherwise, I am just bored. It has stupid things like your baby now is this fruit size. I also want things for me, how I can manage emotion, exercise, eat good, dress comfortable, lotion, spanx, whatever to help me have healthy baby and also feel good. Also, this just funny, but help women know how to get their husband more involved since some have issues with that. (participant 2.1.2)

For these immigrant women, other dislikes stemmed from information resources being insensitive to their socioeconomic status and cultural practices. Some women acknowledged wanting to take care of their diet. However, they were discouraged because existing prenatal resources does not factor their socioeconomic challenges into dietary and nutritional guidelines. Their socioeconomic status affects their perceptions of what is realistically attainable which in turn discourages them from pursuing a healthier lifestyle: “Okay think about it. You can want to be healthy all you want, is just wishes. The real life is a different story. Eating healthy food is very expensive” (participant 2.1.4). Additionally, existing resources lacked sensitivity over their cultural food preferences:

> I don't trust what dem website say. People are different. I need answers from my own people, that why I ask family. All dem white lady doin the yoga, drinkin the Starbucks, and eatin like them bunny rabbit nothing but vegetables and blogs. These apps don't tell me na ting new! I dun need pictures of how a white lady baby grow in her belly! Me want rice and beans, that brown stew, and leave me be. (participant 3.1.1)

4.1.3 Social Support Gaps

As reported earlier in this chapter, participants pointed out specific members of their social circle as sources of support for their emotional or informational needs when dealing with pregnancy stressors. The participants used social media, video and group texting technologies to maintain ties in their home country during pregnancy. Participants were comfortable sharing with a tight family circle of parents and siblings, and then few very close friends. The same courtesy was not extended to other family members and acquaintances: "Ultra sound only for my mother and sisters and very close friends. Not even for the rest of the family.... no ultrasound for everyone to see. If you have haters, you need to be careful" (participant 1.1.3).

The findings revealed that the women's sharing habits in their personal social media profiles proceeded with caution during pregnancy, with the exception of few. One reason for such cautious limited practices is cultural beliefs. Some believed that people's jealousy or envy might cast a curse leading to misfortune, and some might inflict harm on you through acts of witchcraft and voodoo practices: "I myself scared to share too much happy pictures because there are haters, people you know, and I don't want something

bad to happen to my baby" (participant 1.1.4). There were participants who admitted to engaging in social media sharing during pregnancy, but were quickly shamed:

> Postin pics of how perfect your life is and how you happy all the time must fool most people. When in reality you are fat, miserable, cramping and crying all the time for nah reason. Why people lie and making tings up? ... Then tell me why miss perfect over here is saying that she post everything? I bet she post nothing bout her first baby with her other man! ... I'm just sayin, be real. (participant 3.1.1)

When participants did encounter any pregnancy web or mobile tools, they recalled social capability features such as chat rooms that grouped women together who share the same birth month. Participants disliked such tools and cited reasons of observing bullying incidents, receiving conflicting information, and responses that often go out on irrelevant tangents:

> If you have a good question, no one answer, no one care. Only if you a drama queen question, like my baby daddy drama, I don't know what... Women are drama. They judge each other and rude to each other, mean, very mean. (participant 2.1.1)

The participant went so far as to describe such media as an episode of "bad girls club" (participant 2.1.1), a reality television series of clashing personalities living under one roof.

4.2 Design Interventions

After completing phase one, the participants were instructed to come up with design ideas for technologies to reflect on the prenatal health challenges discussed during

the focus group interviews. The first goal for having the participants engage in the design workshop was wanting to see what the women present as potential systems to support themes brought to the table during phase one. The second goal is to understand what more could be done to improve the relevance of mHealth systems and combat limitations of current solutions.

4.2.1 Information Usability

Two design solutions in particular were dedicated to delivering prenatal content to the user based on the needs of the expecting mother. One, the women called *Unlock My Pregnancy*, and another is *Virtual Clinic.* Participants wanted to see content regarding prenatal diet and exercise, misconceptions, body changes and emotional coping strategies. Participants described *Unlock My Pregnancy* as a customized personal pregnancy lifestyle app. On the other hand, *Virtual Clinic* is exactly as the name implies, a clinic. It was the participants' interpretation of what prenatal clinic services should be about, all brought together virtually. The clinic is divided into three suites. Two of the suites, *You Really Should* and *All-Access*, are relevant under this theme. The third one, the *Relaxation Suite*, will be discussed later on in this chapter. The *You Really Should* suite is a lifestyle suite about healthy pregnancy diet and fitness. On the other hand, *All-Access* is a health suite with a week by week content in relevant medical information. Collectively, *Virtual Clinic* and *Unlock My Pregnancy* suggested several usability themes to allow information delivered to be sensitive to the participants' busy lifestyle. For example, participants wanted to see fitness related information and recommended exercises displayed in short 60 second video formats with very minimal accompanying text: "You want to watch this videos when you are taking a break, when you are waiting for bus,

when you are in the toilet, whatever, whenever right" (participant 1.2.1). During design revisions, participants wanted their cultural practices considered. For example, they wanted dietary tips and recipes to reflect familiar cuisine. "No point, if you don't like the food either. Just ask me where I am from? Or figure out what kinds of foods I like" (participant 1.2.4). Additionally, they wanted content to be mindful of their low socioeconomic status. So, they wanted the recommended dietary and nutritional choices that would accommodate their budget and lifestyle: "There is no reason for me to use it if I can't find food advice for things I can afford. So keep that in mind" (participant 1.2.3).

Another design the women came up with to address their busy lifestyle is *Pregnancy Siri*. They wanted something that would be one click away without the hassle of sifting through information to find exactly what you need:

> Think about how amazing it would be to have no tabs, no paragraphs to read, no nothing! Sometime you don't need all the fancy stuff. You just want straight to the point, let's go. You just talk to Siri right, or whatever you want to name her, even he. Ask a question and it gives your answer back for any pregnancy question. Soooo much easier than typing and searching right? Don't get me wrong, family is family and all that but girl sometimes I just want a quick yes or no you know? (participant 3.2.3)

During the critique, participants suggested modifications to improve accessibility to information:

> I for one like to bookmark pages in Google that I find. More imperatively, I want to get back to it whenever I think about what it covers. Sometimes I pin it in my

> Pinterest. Maybe this Siri bookmark questions that I already asked her so that I can visit that answer again. (participant 3.2.4)

Additionally, participants presented several modifications to make *Pregnancy Siri* sensitive to the user's cultural knowledge and practices: "would it understand accents? What about languages? Would you be able to pick?" (participant 3.2.2), while another one added: "it would be nice if it shows what questions people with similar cultures and situations have been asking about and I can click them and hear what they are finding" (participant 3.2.4).

Finally, another resulting design named *Conference Call* allows the pregnant woman to stream any local available classes by community organizations while also inviting any family member to join virtually. Also, it allows a three-way or more virtual appointment among the expecting mother with a volunteer worker available by local organization, while also inviting another family member to join in. The participants values this design because it would allow them better access to available resources within they busy lifestyle:

> You have some organizations that give free access to pregnant women to professionals like social workers or free yoga classes and pregnancy lessons for, which is great. But, you have issues of commuting time and money to get there, when you already have to commute sometimes up to one hour or more on a bus everyday, sometimes for a job or two. Or maybe you have no time with job and family. (participant 1.2.4)

4.2.2 Entertainment

Unlock My Pregnancy and *Virtual Clinic* introduced relaxation and entertainment to reduce stress as part of pregnancy health management. For example, the *Relaxation Suite* within the *Virtual Clinic* endorses a range of relaxation strategies that participants referred to as "me time" (participant 1.2.2) such as providing weekly glossary on mood boosting foods, herbs, scents, beauty and hair routines and added entertainment music, videos, and games. Additionally, the suite was equipped with support features from people in the immediate social circle and professionals as well. The goal for involving the immediate social circle was to boost the user's mood through socializing and better communication. For example, the user may choose to display updates about their pregnancy mood by choosing from a list of mood emojis or sarcastic memes. Then, it sends push notifications to your social circle prompting them to react. They may react by initiating a Skype session, or an invitation for a joint activity, or vote for a relaxation tip. Here is how one of the participants coming up with this design described the value to these features:

> A lot of women feel lonely when pregnant, you are away from family and you bored because you wonder you can't do the same things with friends like go dancing or go somewhere looking cute but you not. But, you don't know how to communicate that. I think, ok, what I would do if I was back home now? You are always having family get together eat and talk hours and hours. Then I should try to do the same here because its fun and being social make you feel better. So now this maybe can help you communicate maybe that better with your husband, your family and friends back home, and your new friends here. (participant 1.2.2)

Also, participants suggested adding a feature where you can chat with or send questions to a medical professional or therapist within relevant cultural organizations about emotional stressors. A user can view bios of these volunteers and therefore ease their stress regarding who they communicate with. Also, it allows the user to ask questions without having to deal with the stress of interacting with strangers in forums with too many opinions and bullying.

4.2.3 Social Support

Participants offered recommendations to help women connect with local community and local organization's resources as means to alleviating burdens and allowing more time to pursue wellness. One resulting design, the participants named *Buddy Network*, showcased a local caregiving social support system theme. Ultimately, the participant's goal was building a reciprocal local support system, through which a two-way give and take platform allows people in the same community to share services and resources such as transportation, childcare, fitness companion, and so on. Here is what a participant shared about the added value to such design:

> When you first come to this country, something like this is really good. Also, its hard when you are not with your family and need help. Even if you have a man, maybe you feel like a single mother. Its good if a group of women want to help each other walk or run, like exercise, and anything else. I don't know what I would do when I first come here, you know, if I didn't have connections like kind neighbors or kind people in the church. It makes a difference. (participant 2.2.2)

Participants were quick to clarify that this is not similar to applications such as *Craigslist* or *Meetup.* To them, it is safer and more intimate, and is built on a system of accountability:

> But, to take, you have to give back. It doesn't have to be back to the same person. But, you can't take without giving, or you can take and then it count as credit, and you can't redeem another favor until you gave something... you subscribe to a community you live in. Maybe through local organizations connecting you, you can choose your own circles. Some features like that... We are thinking this is organized by community leaders, organizations, churches. So, then this can help with safety, also now you don't have to deal with online bullying. (participant 2.2.3)

Another resulting concept for social support, *Video Call*, is one-to-one support app that allows you to video, voice, or text chat with local doctors, or other health professionals like psychologists and nutritionists. After a very brief profiling step, the user will be connected with a professional who can speak the same language and can understand their culture. Participants expressed a preference for building a trusting long-term relationship with their doctors:

> What if I like them? Can I choose the same each time I use this? I think it will be nice to have the same professional every time. I will be willing to wait for them to be available if now I have a comfortable relationship with them, I feel like they know me, they actually know me! Now I don't have to be stressed. (participant 3.2.1)

Several resulting designs came with both local and long distance virtual social support capabilities prompting others to participate in the intervention to aid in supporting the user. For example, *Unlock My Pregnancy* allowed screen-sharing capabilities so that a parent or a spouse can view and contribute to your profile: “Maybe you have contributing days like #familysundays or #husbandsmonday. You see how I sneak that in?” (participant 2.2.4). Those who you allow to contribute to your profile are encouraged to participate by providing a ‘thumb up’ if they are any content or ‘thumb down’ if they dislike:

> So you know what the people who care about you think, and you don’t have to ask them about every single thing when there is time difference or we busy. You know I would be curious, I would feel better too because I have companions with my decisions. (participant 2.2.4)

Similar to *Video Call*, *Unlock My Pregnancy* and *Virtual Clinic* also added social support features enabling chat and Q&A (questions and answers) sessions with volunteer local doctors, nutritionists, fitness instructors etc.

Another design, named *Conference Call*, is about having family accompany you virtually to all your prenatal activities so that you don’t have to feel homesick or alone. The concept allows you to share precious moments during pregnancy with family and friends no matter where everyone is:

> You are homesick when pregnant, or sometimes wish you have family or sisters or friends with you in appointments or when you need to make decisions or need the emotional support you know. Even if they are in the same country or even city, sometimes you can’t both be there at same time. Or, you are even busy. We were

> talking about beautiful memories like skyping with sisters or friends showing how we prepare for a new child. (participant 1.2.4)

Participants acknowledged that it is similar to apps such as Skype or Facetime in a way, and they hope for it to be added as a feature to pregnancy apps. For example, to enable a three way or more video call with in-person doctor appointments, or with a virtual specialist, or to stream prenatal classes, or to view videos together at the same time.

4.3 Summary

The findings from the focus group sessions exposed mind and body stressors influencing the women's ability to engage in prenatal health promoting behaviors. Also, it revealed information sources, challenges to accessing accurate information, and challenges to adopting them into day-to-day lifestyle. Lastly, it revealed the role local and long distance social ties play in pregnancy behaviors and technology use.

The participatory design workshops resulted in design solutions derived from the participants' reflections on our discussions from the focus group sessions. The designs exposed three key themes imagined by the participants in the design of prenatal mHealth technologies. First, participants revealed designs with health promoting content focused on various aspects of the health needs of the expecting mother. They facilitated such content with usability features that delivered information catering to their busy lifestyle, and that were sensitive to their cultural practices and socioeconomic status. Second, the participants revealed approaches for mHealth to facilitate rebuilding the transnational social and organizational support and resources necessary for better pregnancy health management. The women formulating and then revising the resulting designs exposed

attention to the role transnational relationships play in health and wellbeing and how technology can facilitate them. Lastly, the designs introduced entertainment and relaxation activities with elements of social participation as part of pregnancy health management for these women.

CHAPTER 5. DISCUSSION

The findings from three participatory focus group and co-design sessions with Caribbean transmigrant women in the United States will be discussed in this chapter. Immigrant women face added stressors to their pregnancy ecology that challenged their health. Stressors resulting from acclimating to a new country certainly in turn impeded them from engaging in healthy mind and body prenatal lifestyle. There are multidimensional issues unique to this minority demographic, and therefore multidimensional solutions are only fitting. The purpose of this study was to understand the challenges affecting the women's prenatal wellbeing practices, and to conceive a set of recommendations and opportunities for mHealth technology design to assist with prenatal preventative care and management. This chapter identifies opportunities for mHealth and HCI research to consider *designing tailored interventions to the realities of the expecting immigrant mother*, *including the role of transnational social support*, and *embracing the role of entertainment in mental health during pregnancy*.

5.1 Contribution

The findings reveal pregnancy in an immigrant woman's life as a multidimensional ecology affected by her background, lifestyle, relationships, medical access challenges, and the technologies facilitating her transnational social ties. With that

the study's first contribution brings forth an understanding of low-income immigrant women's pregnancy ecology. Shining light into the ecological gaps within the experiences of the participants using prenatal tech or non-tech solutions, present mHealth design opportunities for challenges worth of consideration to design. In the following section, the second contribution presents alternate design recommendations put forth to address limitations for existing undesirable systems informed by the first contribution.

5.2 Design Recommendation

Stemming from the study's findings, an alternative approach to designing prenatal mHealth technologies is set forth with the following recommendations: design for the expecting mother's needs, design tailored interventions, clear misconceptions, consider the role of transnational relationships, and consider the role of entertainment.

5.2.1 Design for the Expecting Mother's Needs

The focus group sessions and the resulting designs revealed experiences the women had using technological and non-technological solutions to assist with their prenatal health and wellness as recent immigrants. Generic pregnancy mobile and web applications focus mostly on the events surrounding the unborn child versus meeting the health and wellbeing needs of the expecting mother. They provided information around the birthing event, fetal development, countdowns to delivery, checklists for hospital visits, generic tips on nutritional and behavioral risks, and birthing complications (Peyton et al., 2014). Additionally, participants cited resources that were centered around post birthing needs such as generic tips on breast-feeding and diaper changing. Participants

did not find something specifically directed at their needs as expecting mothers than focusing on the relationship to the unborn child. These solutions fail to be relevant in addressing prenatal healthcare challenges faced by recent immigrant women. Thus, the resulting designs revealed challenges that they thought were worthy of consideration to design.

Low-income American women identify with "subjective" understandings of pregnancy in which the pregnant woman can not force managing the body with "objective" medical guidelines, and instead must succumb to its demands (Peyton et al., 2014). For example, they believed in eating anything that the wanted during pregnancy to satisfy what they might perceive as cravings, adverse symptoms, and emotional needs versus focusing on a balanced diet with the long-term health gains in mind. They also believed that every pregnancy is different, so the same rules do not always apply. The challenge with such perceptions is designing interventions that can deliver medical information in line with these subjective understandings of prenatal health and wellbeing. The suggestion for design interventions in such case is to address early needs such as cravings, food discomfort, and fatigue as bait to draw women in to eventually lead a healthier prenatal lifestyle (Peyton et al., 2014). To some of this study's participants (but not all) this was the case. However, others felt differently. Several women acknowledged wanting to manage pregnancy and adopt a healthier lifestyle but admitted to not having the proper information and circumstances to do so. A plausible explanation for this conflict with what has been reported in the literature appeared to be the impact of pop culture especially through social media networks, and possibly the age group of the recruited participants in this study.

Therefore, the study advocates for interventions that focus on the expecting mother by providing support with immigrant women's physical, information, social, and emotional stressors uncovered in chapter four. In such case, pay attention to interface design, navigation, and information mediums. Just because pregnant women want their concerns addressed content-wise, does not mean that they want cluttered interfaces with extensive amounts of texts and nested menus. Design minimalistic interfaces with easy visual navigations. For example, use three to four main tabs at maximum, and no nested menus. In place of nested menus, use a descriptive image as a representation for each nested content that can be viewed by scrolling down a page. Additionally, since the study endorses visual and short video demonstrations, add marker icons for 'read', 'watch', 'Make', etc. The advantages of using short videos as information mediums will be discussed later on in this chapter.

5.2.2 Design Tailored Interventions

One crippling access challenge to prenatal medical information for the interviewed immigrant women is not mapping information to align with their demanding day-to-day lifestyle, and lacking sensitivity to their cultural practices. For example, dietary guidelines and nutritional suggestions don't take into account minorities' cultural connections (Boujarwah, Nazneen, Hong, Aboud, & Arriaga, 2011; Brown et al., 2014; Grimes et al., 2008; Siek, LaMarche, & Maitland, 2009) that affect their food preferences and choices. As the results revealed, there is a disconnection between medical information and the realities these women live. For immigrants, there is an emotional connection with familiar food especially when acclimating to a new unfamiliar

environment (Brown et al., 2014). We see this present in the resulting designs as the women reflect on the limitations of existing systems. Similarly, when pregnant and battling cravings while enduring emotions such as homesickness, neglect, and isolation, being able to indulge in culturally familiar foods is powerful. Also, the study calls for sensitivity to the women's low-income socioeconomic status when recommending nutritional guidelines.

The case in point here is not solely over what the recommended cuisine should be. From a design perspective, the bigger picture is that participants would adopt technologies that support their lifestyle. One reoccurring criticism by the participants is generic and impersonal applications that make assumptions without considering the user's cultural practices and socio economic status. The participants felt excluded from prenatal health tech solutions with perceiving them as designed exclusively for "white rich ladies (participant 2.1.3)". Thus, interventions must deliver information in a way that supports their busy day-to-day lifestyle, cultural practices, and socioeconomic status to achieve successful practice and adoption. The added value of engaging participants in design workshops was to understand how they interpret where they live, how they live, their health, their culture, their relationships, the food, etc.

Since the purpose is creating tailored interventions, tracking commands (Haapala et al., 2009) are not for these women. Technologies that require the user to input data such as actively plugging your meals and fitness accomplishments are not ideal for the immigrant woman busy lifestyle and pregnancy fatigue. Instead, use prompts and reminders that will allow the pregnant user to make their own choices. Also, the study recommends using alternative input techniques that do not require the user engage in

tedious and time-consuming data entries. Instead consider accompanying prompts with input techniques such as yes/no answers, like or dislike commands, and emojis such as thumbs up or down icons, etc. These can be used a profiling technique on the user instead of requiring them to fill out questionnaires and quizzes. Finally, the study endorses the use of short 30 to 60 seconds video demonstrations to deliver content. This short content viewing strategy recommended by the user accommodates their busy lifestyle.

5.2.3 Clear Misconceptions

Because of medical access challenges, the immigrant woman seeks out guidance from her social circles and the Internet instead. Women are then exposed to conflicting, misguided, and false information. Information is transmitted through such channels without a proper vetting process. As reported in chapter four, there is a critical information gap in immigrant women prenatal ecologies where a need and demand for fact or fiction content is not met.

The debates reported in chapter four surrounded topics such as safe fitness levels and practices, ideal food consumption habits, and healthy weight management. These are similar misguided topics reported for low-income pregnant American women (Peyton et al., 2014). However, the study's findings added cultural discourses unique to this demographic. In this case, examples included narratives linking birthmarks to unfulfilled cravings, red foods and baby animals for fetal development, wood floors to miscarriages, and so on.

Design of mHealth interventions should address not only common misconceptions, but also culturally and socially specific folk wisdom discourses passed down and around about pregnancy. The latter are discourses that might be specific to a targeted demographic and need to be researched and included in mHealth interventions. This is an area in which mHealth design can make a significant contribution to pregnant immigrant women's health.

5.2.4 Consider the Role of Transnational Relationships

Because of the absence of family and at times the neglect by their significant other, the participants defaulted to transnational ties for social support during pregnancy. Transnational social support within the context of immigrants is about accessing social support resources in the receiving country while also maintaining existing ties in the origin country (Basch et al., 1994). The term 'transmigrants' was coined to describe immigrants that neither limit themselves to their geographical origin, nor to the limits of the new migratory space (Basch et al., 1994). Instead, they proactively and creatively partake in new ways in developing a new sense of self and maneuvering creative routes to resources to help the new self. The conception of the term transnational social support is accredited to technological advances in communication technologies such as the use of the Internet and cellular phone capabilities (Basch et al., 1994). Hence, the use of the term transmigrants at times throughout this dissertation to reference the participants.

Several of the resulting designs further emphasized how transmigrant women value the important role social support plays in coping with pregnancy stressors. Thus, this study joins previous studies (Brown et al., 2014; Peyton et al., 2014) that are pro-

social design in healthcare interventions. But, within the context of this study's transmigrant participants, the findings are rather pro-transnational social design in healthcare interventions. Incorporating the roles others play in a woman's life is suggested in the literature for HCI and health design interventions (Brown et al., 2014; Peyton et al., 2014). However, what role do others play during pregnancy in a transmigrant woman's life? Who inflicts burdens on her time, and who provides support during pregnancy? Who challenges how the pregnant woman constructs meanings of health behavior seeking and technology adoption patterns?

The transnational relationships in a transmigrant woman's life fluctuate in influence and contribution power depending on her informational and emotional needs at a particular time throughout the course of pregnancy. Concluding from the participants' accounts during focus group and design sessions, available prenatal technologies offer no social support capabilities despite the role relationships play in a pregnant transmigrant woman's life. Social features and capabilities should enable valued transnational interactions to contribute in the women's pregnancy mHealth interventions. Here is how the study envisions interaction scenarios that facilitate local, long distance, and individual caregiving themes the pregnant transmigrants might be interested in.

5.2.4.1 One-to-one Interactions

Enabling one-to-one interactions in mHealth prompts others to participate in the intervention to aid in supporting the user. This type of interaction engages the intimate relationships in a pregnant transmigrant's life and provides a platform for rebuilding social support with relationships that affects their health behaviors.

For example, as the findings revealed, the significant other, whether compassionate or indifferent, plays a major role in a woman's pregnancy. Another example was revealed in the role family and close friends play in an immigrant pregnant woman's life. Because of the long distance separating families and the idea that pregnancy is a family affair, facilitating a platform for family to participate in a transmigrant's pregnancy practices presents an opportunity for mHealth design. While previous studies (Peyton et al. 2014) emphasized the role of the spouse alone in a woman's pregnancy, this study introduces the mother and siblings who are just as important. Mothers especially seem to play a dual role, in which they are a reliable support system while at the same time a source for folk misconceptions. The mother role is something that has been ignored in past literature. Such relationships represent indirect stakeholders that might affect whether the transmigrant woman decides to adopt a technology or not.

Thus, in this study we call for gender-neutral designs (Peyton et al., 2014) to encourage the inclusions of everyone in the pregnancy process. Also, consider adding social support enabling features such as interactive screen sharing, saved video chat messaging, the use of prompts and creative contribution commands.

5.2.4.2 One-to-many Interactions

A one-to-many interaction scenario provides a platform for rebuilding organizational support. The findings revealed participants desire a caring connection with professionals whom they seek medical and wellness guidance from. This is consistent with findings in the literature regarding immigrant women's health (Brown et al., 2014).

This was highlighted in chapter four by designs such as *Conference Call, Video*, *Virtual Clinic*, and *Unlock my Pregnancy*. Additionally, participants desired such interaction scenario in mHealth technologies that would help local community organizations provide their services virtually. The purpose is to allow for easy access by accommodating their busy lifestyle because of commuting time and fatigue. Also, the purpose is to accommodate with their low socioeconomic status due to the cost of commuting.

5.2.4.3 Exclusions in Interaction Scenarios

Within previous HCI rand social networking research (Balaam, Robertson, & Fitzpatrick, 2013; Gibson & Hanson, 2013; Morris, 2014) pregnant women are described as comfortable sharing pregnancy and motherhood information on online social settings, even with strangers. This certainly contradicts with the findings in this study and a previous study on low-income pregnant American women by Peyton et al. (2014). While the study by Peyton et al. (2014) does not explain this finding, what accounts for these contradictions are examined to a greater depth in this study. Lets examine what's been concluded from the findings on the participants' social sharing habits during pregnancy, and imposed impact of social sharing networks on the transmigrant's pregnancy ecology.

In sharing with family, participants preferred mostly using private group text messaging apps such as Whatsapp, and video chats such as Skype. Participants were comfortable sharing only in intimate social circles such as with parents, siblings, and few very close friends. The findings revealed that the women's sharing habits in their personal social media profiles were conservative and cautious during pregnancy, with the

exception of few. Cultural beliefs, shaming, distrust over what people share on social media, and fatigue were some of the reasons covered in chapter four.

In the context of pregnancy, some transmigrants took on the role of viewers than sharers in interactions with strangers on social networking tools. Being a viewer allowed these participants to seek motivation and inspiration to engage in healthier activities. Others used it as an entertainment tool to feed curiosity and deal with boredom. Very few transmigrant participants did engage in online social media sharing during pregnancy in which their content was viewed by family members, co-workers, and acquaintances. There might be slight variations in sharing habits among transmigrants depending on factors such as age, exposure to pop culture, and the desire for a socializing support outlet while pregnant in a new country.

However, all participants seemed to have no desire for engaging with complete strangers online. All participants disliked chat rooms and forums in any web or mobile pregnancy tool, which sometimes grouped strangers together who share the same birth month. They cited reasons of disapproval such as bullying, conflicting information, and responses that often go out on irrelevant tangents. As a result, participants did not feel comfortable engaging and sharing with strangers online within pregnancy tools.

5.2.4.4 Many-to-many Interaction Scenarios

The only case of sharing with strangers the study's participants felt at ease with were a community building form of social sharing. This theme was present in the resulting design *Buddy Network*, which facilitated the concept of local caregiving. For immigrants, new ties in the host country contribute for an easy transition by providing

help in guidance with navigating the new country, help with transportation, childcare, and socializing. What eases such interaction is that those who feel marginalized or excluded by the healthcare system and existing technologies come together because of shared circumstances to engage in a reciprocal relationship for the purpose of community building and organizational support. Such interventions can create opportunities for guided interaction within these groups to support and facilitate community sharing. The study suggests that such interventions be directed by local community organizations to ensure safety and accountability.

5.2.4.5 No Role Interactions

Not every design needs to include social support capabilities. Discussions during focus groups and one design by the study's transmigrants, *Pregnancy* Siri, revealed that in certain instances participants preferred managing pregnancy independently and in others discretely. Therefore, designs that require no role from others are intended for the pregnant woman's individual self-support use or individual private use. This conclusion is consistent with online information seeking behaviors of Caribbean immigrant women (Brown et al., 2014). In such case, the built-in support capabilities of the technology itself are sufficient for achieving their needs. This presents an opportunity for future mHealth to examine in-depth what entails designing for technologies that supports pursuing wellbeing discretely for transmigrant pregnant women. This certainly does not fit well with social networking technologies that publish to others, for example, the user's fitness activities and progressions.

5.2.5 Consider the Role of Entertainment

The female participants came up with designs to manage emotions and mental pregnancy stressors. They believed in the healing influence relaxation and entertainment activities provide in managing pregnancy health. Being healthy during pregnancy for these women goes beyond what's been predominately covered in HCI prenatal work that's been oriented towards topics such as dietary needs and weight management (Peyton et al., 2014; Phelan, 2010). This is especially significant because of the emotional challenges reported by the participants in chapter four, and the likelihood of Caribbean women not receiving treatment for mental health issues (Williams et al., 2007) such as perinatal depression (Edge et al., 2004), and domestic abuse (Brown et al., 2014), which puts them at higher risk for prolonged mental distress than white American women.

While this often ignored component was introduced in a previous study on immigrant women health by Brown et al. (2014), this study joins by endorsing the value of entertainment but in the context of pregnancy for transmigrants' mHealth design interventions. This means not only being pro-entertainment by advocating for relaxation activities as part of mHealth interventions (Brown et al., 2014), but also in adding a support aspect to it. This comes in a form where a technology prompts the important transnational ties in a pregnant woman's life to contribute with recommended or joint entertainment activities.

5.3 Limitations

The limitations of this study included sample size and HCI feasibility of the resulting designs from the participatory workshops. In this section, the researcher

discussed each and provided an alternative outlook in which such limitations could be advantageous for the goals of this particular research.

5.3.1 Sample Size

The limitation of small sample size in this study was in part due to the extensive amount of time and work it took to engage and recruit these participants and schedule sessions with them. Additionally, the researcher was focused heavily on achieving depth to the emerging data and did not want to compromise the integrity of the data by focusing on a larger sample within the time constraints of this research. Small sample sizes are appropriate in certain research instances. Inductive exploratory research concerned with generating rich and multidimensional concepts from the data itself rather than being implied beforehand may benefit from small sample sizes (Crouch & McKenzie, 2006; Dreher, 1994). In such cases, small samples can enhance the researcher's role in recruitment and engagement with participants (Crouch & McKenzie, 2006; Dreher, 1994). Also, it allows for repeated access to participants, which strengthens the validity and reliability of the data (Crouch & McKenzie, 2006, Dreher, 1994).

5.3.2 Feasibility of the Resulting Designs

While participatory frameworks provide a platform for marginalized stakeholders to be heard, there are limitations to this approach. The participants did not have design or medical expertise, but the knowledge projected was part of their reflection on personal experiences. Future research must critically examine and validate the feasibility of proposed designs in accordance with HCI and medical limits and guidelines. Additionally, when such issues arise, consult with HCI and medical expertise to come up with

alternatives for the proposed designs that build on already accessible technologies for this particular demographic. However, in this study the highlights are not the resulting designs per se, but rather the concluded understandings derived from the researcher reflecting on these designs (Brown et al., 2014). In-depth qualitative inquiry protocols are best analyzed through the researcher's reflective and interpretive work with the emerging data (Crouch & McKenzie, 2006).

5.4 Future Studies

In this section, future directions towards a focused prenatal health initiative, HCI feasibility, transnationalism as a methodology, and economic and policy infrastructure are discussed.

5.4.1 Specific Prenatal Health Objectives

Even though this research focuses on preventative mHealth care interventions, it does not lend itself to investigating a specific wellness initiative in prenatal healthcare for immigrant women. Per examination of previous research (Peyton et al., 2014), women were more receptive to discussing their subjective perceptions of prenatal health versus discussing objective medical initiatives such as healthy weight gain during pregnancy. Considering the goals of this study, a general discussion was appropriate for understanding the immigrant women's perceptions of prenatal wellbeing. However, future research can build on this study by focusing on a narrower scope within prenatal health for immigrant women.

5.4.2 Transnational Methodologies

The findings and especially the resulting designs are situated within the context of transmigrants. Therefore, to acquire and understand a comprehensive picture of technology access, use, perceptions, and adoption patterns, we must interrogate meanings of context beyond the immigrant's local context and conditions (Nogueron-Liu, S, 2013). An examination of the context in their country of origin is necessary to establish an understanding of technology access issues such as technology availability, connectivity, and speed to determine whether an mHealth technology can indeed support transnational ties in the prenatal intervention. This is outside the scope of this study, however, it is an opportunity presented for future research to explore transnationalism as a methodology for this topic of research.

5.4.3 Sound Financial and Policy Infrastructure

Scalability of mHealth interventions is about creating an enabling policy environment, and a diverse long-term funding system to expand the implementation of an emerging technology (Jimenez, 2011). In order for an mHealth solution to deliver its intended promises, it must be sufficiently coordinated and funded (Mechael et al., 2010). A sound and sustainable financial agenda and policy are just as important as predesign activities to ensure successful technology launch. However, this is beyond the scope of this dissertation, and therefore is set forth as a recommendation for future research.

5.5 Concluding Remarks

Migration stressors can impose health challenges on the pregnant woman. As this study joins others in addressing the health needs of minority groups in HCI research, it advocated for designing appropriate prenatal mHealth interventions that explore the multidimensional ecology of pregnant low-income transmigrants. Therefore, the study's methods aimed to understand how transmigrants view their ecological gaps that challenge and influence technology design and adoption.

Inspired by mHealth and health HCI literature (Brown et al., 2014; Peyton et al., 2014; WHO, 2011; Balaam et al., 2013), and the participants' reflection on their ecological gaps through design, the study revealed several considerations for pregnancy mHealth design in the context of transmigrants in the United States. Prenatal mHealth interventions must be explored beyond the traditional way of focusing on the events surrounding the unborn child. It must tap into the needs of the expecting mother and beyond that by, for example, considering the role transnational ties play as motivators or challengers to her pregnancy wellbeing. Additionally, it must explore ways that customize pregnancy information based on variability of lifestyle, cultural practices, and socioeconomic status, and yet be able to deliver appropriate guidelines. Finally, provide entertainment and relaxation as part of a wholesome prenatal wellbeing approach to address mental and emotional care.

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APPENDICES

Appendix A Consent Form

For IRB Use Only

APPROVED
APR 08 2015
EXPIRES 4-7-16
PURDUE UNIVERSITY
INSTITUTIONAL REVIEW BOARD

RESEARCH PARTICIPANT CONSENT FORM

Prenatal Health Technology Design for Caribbean Women:
A Technology Design Study
Dr. James L Mohler, Hana AlJaberi, Ph.D. Student
College of Technology
Purdue University

What is the purpose of this study?

You are being asked to be in this research study to help bring knowledge to the design of prenatal health technologies for Caribbean immigrant women in the United States. I am Hana AlJaberi, and this study is part of my doctoral research at the Purdue University College of Technology.

You have been asked to be in this research study because you fit the requirements for participation in this study. Up to 50 women might be part of this study, but that number can be less. Please read this form and ask any questions before you choose to be in this study.

What will I do if I choose to be in this study?

- You will be part of a focus group interview with two steps. In step 1, we will talk about different relationships and also about using technology in your pregnancies. In step 2, you will work on a design exercise with your team.
- You will allow me to record this group interview
- If you do not want to have your answers recorded, please tell me. I will not record them.
- I may email you/or call you after today to ask you to come back here for more questions for this same study only.

How long will I be in the study?

You will be in this study for 2 hours:

- 10 minutes: Read or listen to me read this form.
- 20 minutes: Enjoy food and drinks + talk about today's rules
- 30 minutes: Step 1 of group interview
- 10 minute: break,
- 50 minutes: Step 2 of group interview

What are the possible risks or discomforts?

Risks to you are minimal, no greater than everyday life. Breach of confidentiality is a risk. However,

the confidentiality section of this form describes how the investigators will keep your information confidential..

Are there any potential benefits?

There are no direct benefits.

Will I receive payment or other incentive?

Free food and drinks are offered to thank you for volunteering to be here today. If you decide to not be in the study at any time, you can still enjoy some of the food before leaving.

Will information about me and my participation be kept confidential?

- Today's records may be reviewed by departments at Purdue University responsible for regulatory and research oversight.
- There will only be one password-protected copy of the audio recordings that will be kept in the researcher's flash drive. The recordings will not include any personal information that can identify you. Also, they will be destroyed in two months or less from today after writing them on paper.
- If the researchers make the results of this study public we will not include any information that identifies you. You will be addressed using a different name that you will pick today.
- Researchers cannot control what those of you here today decide to share to others outside of this room when you leave. So, please take personal responsibility to protect the privacy of others in this room like you.

What are my rights if I take part in this study?

- You are volunteering to be in this study. You can choose not to be in this study, or if you choose to be in this study, you can leave at any time without losing your confidentiality rights.
- If you choose to be in this study, you can skip any question you do not want to answer, or ask to stop recording at any time.
- We will also contact you in order to make all of your today's records available to you for review before making any part of this study public.

Who can I contact if I have questions about the study?

If you have questions after today, you can email Hana AlJaberi at haljaber@purdue.edu or call at 1-765-337-7474. You can also email Dr. James Mohler at jlmohler@purdue.edu.

If you have questions about your rights as a person taking part in the study, please call the Human Research Protection Program at (765) 494-5942, email (irb@purdue.edu)or write to:

Human Research Protection Program - Purdue University
Ernest C. Young Hall, Room 1032
155 S. Grant St.,
West Lafayette, IN 47907-2114

Documentation of Informed Consent

I have read this consent form. I have been able to ask questions about the form and the study, and my questions have been answered. I agree to be in this study. I will receive a copy of this consent form after I sign it.

_____ _____

Participant's Signature Date

_____

Participant's Name

_____ _____

Researcher's Signature Date

Appendix B Procedures Script

Focus Groups:

Reflect on your pregnancy experiences as an immigrant related to the following keywords (topics)?

Keyword	**Moderator add-on probes**
Pregnancy	• In your opinion, what does it take to have a healthy pregnancy? • What was challenging during your pregnancy? • How did you obtain your pregnancy information?
Relationships	• Whom do you most often communicate with in the US or your home country during your pregnancy? • Can you describe the roles relationships with domestic partner, friends, and family play in your understandings of pregnancy? • What are the strengths and weaknesses of each that might at times make one take precedence over the other?
Organizations	• Discuss the role of care providers and social or religious organizations whether in the US or your home country during pregnancy in the states?

Co-design Workshop:

Step 1: With your partner, in separate groups, come up with the worst design ideas you can possibly think of for technologies that offer solutions to pregnant immigrant women.

Step 2: Present it

Step 3: Now, design future interactive systems to turn those bad ideas to good ideas

Step 4: Each group present your ideas/sketches/designs

Step 5: Now, each group should swap designs. Then, each group take time to reiterate on the other group design. Think about the following when you iterate:

- What do you like or not like about it? What constraints or limitations you see to this design?
- How can you improve it? What can you add or remove from it to make it better?
- Which trimester are you designing for?
- Think of key themes like: individual use, one way use, two way use, physical, emotional, information, local caregiving, long distance caregiving

Appendix C Transcripts

Focus Group 1:

Moderator: Okay, let us begin. I want you to reflect, okay, on your pregnancy experiences as an immigrant here, related to the following topics. We will cover, one: pregnancy, two: relationships, three: technology. So, again, every time we move on to a topic, I want you to reflect on your pregnancy experiences as an immigrant related to these topics. Cool? Okay.

Let us begin, ladies. First topic we will reflect on is pregnancy. So! In your opinion, what does it take to have a healthy pregnancy?

Anyone? Come on now, don't be scared. How about 1, what do you think?

1: Owhm, whaaat, why me? I'm sorry, no for real I'm sorry, I'm just playing with you. First, food is important, eat good food. Cravings important.

Moderator: You are funny. Thank you 1. Okay, what about 2?

2: Well, eating enough is good, ofcourse. But, you have to make sure the food is healthy obviously. You don't just eat whatever.

Moderator: 3, do you agree? With what everyone so far is saying?

3: But when you pregnant you have craving. You don't have control with what kind of craving you have and the body needs. You eat for the baby and for you. Right now to be anorexic and worry too much about looking like a supermodel better wait. Its not healthy to try and be this way with a baby, you know what I say?

1: I have cousins. It is not good for the baby. First you know if you don't eat what you crave, your baby will have the blue with green marks somewhere in the body. Man, what is it?

Moderator: What? You mean birthmarks?

1: Exactly. I have cousins like that because my aunt man didn't eat what she was craving. You don't want your baby to live like that, its not good.

Moderator: Oh my god, I heard that too when I was growing up, but I did not know if it was true or just old school talk you know.

2: I know that too. You should eat your craving but in moderation. You should not want to be skinny ofcourse, but you don't just eat everything like you never going to have that cake again. No, I am sorry, not good obviously.

Moderator: Yes 1?

1: Even if 2 is right man. It is not real if you say you can do it. I don't do it when I am pregnant, I will lie to you if I say I do it. Its not so good man, I know.

Moderator: 1, I feel you, trust me. Help me out here though, why do you think you are doing one thing when you believe another way is better?

1: Oh, waw. Healthy food is rich people food in this country. Back home, healthy food is poor people food. Opposite, you know. You can't.

2: It is true. Well, even if you can afford healthy food in this country, weight still creep on you. You have no time to exercise, good luck with that.

Moderator: I really feel you both. Great discussion. 1, tell me why do you not have time to exercise? Does anyone else feel the same way too?

1: Think about it. Some of us might have two jobs. This city is not made for walking. Back home you walk a lot to get from a to b. But here if you take the bus, commute can be more than one hour, you sit on your ass.

3: But it is not good when you start to show. This is not the time to try to look cute. What is this.

Moderator: 4, any thoughts?

4: People say is not good to exercise when you start to show. Before you show is ok? Really? I use to think the same but walks ok only. But you have all celebrities exercise when pregnant, so I am curious now ok? I googled, and find out it is good for you. It will make your mood better, and delivery of your baby so much easier.

1: You have time?

2: You can find the time if you really want to.

3: So you are one of the crazy instagram pregnant woman with six abs.

Moderator: Ok ladies, lets agree to disagree. Now lets move on. What was challenging during your pregnancy?

3: Yes, imagine having pms for nine months. You cry you don't even know why. Your whole body hurts, places don't make sense.

1: Yea man some women have better pregnancies. Like my aunt she go through pregnant like its nothing. Me my whole body hurts too, I have no energy in the morning, morning sickness man. So emotional like I'm crazy. My husband sometime just sit quiet ok he know I don't mean it. I am cute and funny when not pregnant (laughs)

Moderator: I am sure you are quiet and funny the same when pregnant. 4, you are so quiet, what do you think?

4: I love being pregnant. The process is easier to me. But I would say challenging is expenses like not being able to afford help. Also, I get bored.

Moderator: Why do you get bored?

4: Well, I love salsa nights, but I can't go dancing when I am pregnant its not cute. I don't go anywhere because I don't have anything that is cute to fit. I don't like buying pregnant cloths because your body changes and you have to spend a lot of money to keep up.

Moderator: Is that why also expenses are stressing you out?

4: At the beginning yes, but then you just learn to accept it, in terms of not looking cute or having social life for nine months. But it still effects you. But you also stress about expenses for the new baby. Also eating healthy food is expensive.

Moderator: great points 4, thank you. Okay, let's move on. Think about how did you obtain your pregnancy information? 1, what do you think?

1: Google man. They are better than doctors these days.

Moderator: Why?

1: You can find everything online these days. Its free, no games. You can understand better. Doctors never have the time for you.

3: Yea I mean I don't like going to doctors. They don't tell you anything. Prenatal or whatever is overrated. You can do your prenatal health on your own. Our parents did it. Its just a hustle to take your money.

1: And the brochures they give you don't help. Even some of the nurses and doctors are so rude. Not encouraging to ask anything. Sometimes they look at you like you ignorant. Why do you try to rush me.

Moderator: I can see that. These are valid reasons. 4, how did you get your pregnancy information?

4: Yea I agree. Can I say my mom and internet. She is like encyclopedia of information, she went through it many times so she is wiser. Sometimes she has better answers even somethings I can't find on the internet she has answers for. Ask any older person in your family really.

Moderator: Such a great and such rich discussion. Your are doing great keep it coming please. Okay! Now I want to move on to the topic of relationships. Okay? Again, I want you to continue to keep reflecting on your pregnancy experiences as an immigrant as we discuss my questions. Now, tell me, whome did you most often communicate with in the US or your home country during your pregnancy? 3? let's go.

3: Communicate? Like call?

Moderator: yes, call, text, facebook, instagram, whatever. Can be in person too like seeing them, grabbing coffee, anything really.

3: Umm ok ok . I always communicate with my mom when pregnant, more than the usual. She stays in my country. So, its hard to talk on phone whenever I like. But, she knows how to use internet now, we use whatsapp and skype whenever we can.

Moderator: 2? what about you?

2: my mom obviously even sometime she is kind of old school for my taste. But, my mom passed away. She was here only for my first baby. But, since she passed my second pregnancy was really hard. I am lucky my boyfriend is supportive. But, he is American. My ex husband was not maybe because that is how most men are in my country. I don't get along with girls, in south Florida they are weird and then girls from your country too are so nosy, gossip.

Moderator: 4, what about you?

4: my mom and my sisters. We all have children so we talk about it all the time and we share advice when anyone is pregnant.

Moderator: 1? and what about you?

1: my mom is too old school for my taste too. We new generation think different. But, still she give good advice. She also give good help, cook and take care of you. Nothing like mama. To answer your question, my friends too who had children will understand me the most when I am pregnant. I had good friends in my country, these days very easy to keep in touch, some moved to other countries, we still talking. I have some good friends I meet at work and church, they help with advice too.

Moderator: okay. Now, think about what are the strengths and weaknesses of these relationships that play a role in your understandings of pregnancy that might at times make one take precedence over the other?

3: its hard sometimes to talk to my mom any time I need something because time differences.

1: some of the advice my mom gives me man is so old school it gets my nerves. She say stupid things stuff sometimes.

Moderator: like what 2? 4 I see you agree with her.

2: I agree too, but I loved my mom, nothing like your mom when you are pregnant. I wish she was still here.

1: No I agree, you run to mama no matter what. But sometimes, okay, eat this and that so that the baby have light skin. Or eat this and that so it can be a boy or this and that if you want a girl. Many things man, eat the baby animal, not the grown up animal. Don't shower for weeks after you give baby, there is more, I can't do it.

Moderator: My mom says the same things, she is old school like your mom. 2? do you have anything to add?

2: sometimes some of the questions you have is embarrassing to ask your mom or doctors. So I just go on google.

Moderator: like what type of questions, if you can think of any? If its too embarrassing you don't have to say. But, we are all women here.

1: I feel the same way, we all women. I have embarrassing questions too. My second time when pregnant, I separated with my husband. So you get lonely and you want to date. But, then maybe your friends will judge you. They say sex is good when you are pregnant, you will have the baby easy. But, I wanted to know if it was okay with another man for the emotional health of my baby.

Moderator: okay, lets move on to the last topic before we take a short break into the second phase. Lets talk about technology. How did you use or not use technological tools like cell phones, internet, social media etc during pregnancy? Lets go, who is first, how about 2?

2: okay. I know I just loved taking and uploading pictures of me pregnant at instagram and facebook. Wearing cloths ofcourse.

Moderator: beautiful. What kind of pictures did you upload 2?

2: I remember taking pictures of how my pregnancy stomach was growing, all the time from beginning to end. Like pregnant selfies.

Moderator: that's very cute.

2: I put my first baby ultrasound online too. Ofcourse not every picture is for everyone to see. I definitely have privacy settings for only some people in my list. Or I just send a picture I want directly to somebody or a group, like in my whatsapp.

Moderator: So, were you comfortable with your pregnancy body?

2: not really. You never. But, I think I look better in pictures. You can use filters and if you are smart with how you pose, you will look sexy. You have more curves, you know like big butt and boobs, big lips too. So, I have a chance to celebrate my pregnancy. I also sometimes go online and look for pregnant women pictures like instagram and pinterest, who dress up and workout, so I can be motivated.

4: you have to be careful though. Every pregnant body is different I think. The last thing you want is to try and have unreal expectations of your body just because someone else can.

2: I don't think so, its good motivation. I can also say that I like when people like my pictures or put a comment things that I am glowing or say other nice things and it makes my day better because then I feel better about myself. It's hard when your body is changing and you are worrying about it.

4: okay, I feel you.. You take control. But, we only post the happy stuff but we don't post our stretch marks, the swollen face and feet.

2: I love my swollen lips and junk when pregnant.

4: the beauty of online is you can pick and choose what to post and how to post it. Which can make you feel better and run from your problems. We don't share depressing things in instagram or twitter.

3: I will feel better seeing another people going through depressing things like me.

Moderator: great points everyone, thank you. Any other uses? Also think about how you did not use them?

3: no ultrasound for everyone to see. If you have haters, you need to be careful. But for me the answer to your question Hana is google is my technology friend when I am pregnant. I like understanding things about myself. But, many times I get very stressed

because there is too many opinions to choose from. Or sometimes the language is very medical, hard to understand. I just want something simple to understand right away.

4: I agree with you. I myself scared to share too much happy pictures because there are haters, people you know, and I don't want something bad to happen to my baby. I don't want to scare you to think I am crazy.

Moderator: what do you mean? I don't think you are crazy, I know what you are talking about, but no offense and correct me if I am wrong. We have similar things like witch craft like voodoo you know, or something else called evil eye, is it the same?

1: oh my god, you are so cool

Moderator: you are funny! I told you we come from similar backgrounds

3: so you know what we are talking about. Ultra sound only for my mother and sisters and very close friends. Not even for the rest of the family.

Moderator: Okay ladies, you did great. Lets take a good break now, then we will come

back to do phase number two.

Co-design workshop 1:

Group A
VIRTUAL CLINIC

Bad design:

2: We were talking about paper brochures. We think they are junk, useless.

1: Yeah. By the time I get home, you know, I already remove the brochure from my mind. By the time I get home, it is part of the trash if I remember that is somewhere. Mostly all wrinkled in my handbag.

2: Exactly. No one read it. I don't know why, but I am sure no one do it.
1: for the good design you go.

Good Design: Virtual Clinic

2: okay. We have, we calling it, 'Virtual Clinic'. It will have three suites: 'You Really Should' suite, 'All-Access' Suite, 'Relaxation' Suite. So, here where do you want to go? Okay, so let's say you want to visit the 'You Really Should' suite first. In there, you find foods good for you and their benefits, recipes from your culture that are healthy, and then

some exercises if they are good for you, because we hearing a lot of arguing on exercise here so clarification and also free videos of them will be good for you. Everything organized week by week.

1: Everything is in short maybe sixty second video. Visuals no reading. Short description is ok. You want to watch this videos when you are taking a break, when you are waiting for bus, when you are in the toilet, whatever, whenever right.

2: Maybe you can chat with a nutritionist or trainer or even you want to text with one if you have questions. They can be blogging too, new material added always to keep fresh.

1: Then say you want to go the 'All-Access' suite. There you have information on what to expect week by week in your body changes, emotions, health in general for you and for the baby. What to look for you know, be prepared. Typical health signs and what to do. You can also have the option to chat or text with a professional, maybe obgyn yeah, with questions if you have. You can do the same in all three suites. You don't want to go to random forums or chat rooms, people are annoying. You can see who this people are so you feel comfortable.

2: Then if you want the 'Relaxation' suite, the me time, aaaah now we talking. You can join for a real person like a volunteer therapist or social worker to write to, to ask questions if you need help with stress and emotions or whatever. Or activities to help you relax, make playlist music for relaxation, or whatever relaxation technique videos or games. Also, you have glam section like video tips on stress free pregnancy beauty and glam routines, low maintenance, week by week, quicky tips for food making you feel better, smells, herbs, all.

1: this section also can be your personal blog. Not so much writing like traditional way, it's more like sharing things you found and like. Like maybe section called #obsessed or #mood which anything related to you or share #mini which about baby like maybe cute things you find online.

2: You screen share it with anyone you decide to add to your network so they can see your content, and also contribute. A lot of women feel lonely when pregnant, you are away from family and you bored because you wonder you can't do the same things with friends like go dancing or go somewhere looking cute but you not. But, you don't know how to communicate that. I think, ok, what I would do if I was back home now? You are always having family get together eat and talk hours and hours. Then I should try to do the same here because its fun and being social make you feel better. So now this maybe can help you communicate maybe that better with your husband, your family and friends back home, and your new friends here.

1: Yes. And the important difference here from a brochure is not too much to read and read. Videos always better. Also, no junk to add to your house. Everything in one place online or in your phone, you can take anywhere, and use it anywhere and anytime.

Group B Critique

3: We like that you can find everything in one place. If its designed clean and not all over the place, we see potential. There is no reason for me to use it if I can't find food advice for things I can afford. So keep that in mind.

4: No point, if you don't like the food either. Just ask me where I am from? Or figure out what kinds of foods I like.
I love we are including the husband, I don't know if it will help some women, but worth the try. But for sure the people who their husband likes to be helping will like something like that. Another point, is the content free? Volunteered? Or is there minimal price to access this? Who can afford it?

Group B
CONFERENCE CALL

Bad Design:
3: for bad design, just finding website on google with too much general information or too complicated. Or regular doctor visits with rude nurses, that don't tell you anything and don't understand you as a human being.

Good Design:
4:
You have some organizations that give free access to pregnant women to professionals like social workers or free yoga classes and pregnancy lessons for, which is great. But, you have issues of commuting time and money to get there, when you already have to commute sometimes up to one hour or more on a bus everyday, sometimes for a job or two. Or maybe you have no time with job and family.
You are homesick when pregnant, or sometimes wish you have family or sisters or friends with you in appointments or when you need to make decisions or need the emotional support you know. Even if they are in the same country or even city, sometimes you can't both be there at same time. Or, you are even busy. We were talking about beautiful memories like skyping with sisters or friends showing how we prepare for a new child.
Something to add to apps is the option to have people you love join you, add them to three way skype or whatever, facetime right. These organizations should have virtual services, where you can join a class online, or speak to their volunteer professional online. But it will be nice that in these online sessions with a social worker, or any professional or class, you can add family members or friends you want to join in from anywhere in the world. You can share the little important times with your loved one real time. Or have them be there with you to help make decisions together and understand and discuss whats going on together when you have doctor appointments because you always need a family opinion and also have them all understanding and in the same page.

Group A: Critique

2: This sound very convenient. The option to facetime during virtual service can make you want to do it more, encouraging, less stress, because you have someone to do it with. We p

1:
The problems or questions to ask is concerns of lagging and speed, and then is there time difference.

2: If the some of the stuff can stay up there, you can go do it any time anywhere when you have better connection or better timing.

1: I thought of some things about the clinic, sorry not relevant, can I add?
Moderator: of course, let's get back to it then.

1: ohh, what if like you show mood updates, whatever you like, mood faces or one of funny memes, I love them so funny. When you update how you feel, it tells you family and your friends like it send them invite or something, now they know, bam! Now it ask them how do you want to help her? Skype her? Want to do something together? Or here like a suggestion we give you to make her feel better?

2: Yes!! Shame them to do it, I love it.

Moderator: I love it too, that is funny as hell.

Focus Group 2:

Moderator: lets begin, everyone, please. Okay? Get seated. There you go get comfortable please. Everyone ready? Okay. Now first, I want you to reflect on your pregnancy experiences as an immigrant here. We will discuss the following topics together. Topic one will be pregnancy. Topic two will be relationships. Topic three will be technology. Lets get to it! Okay topic one is pregnancy. I want you to reflect on your pregnancy experiences as an immigrant related to the topic of pregnancy. In your opinion, what does it take to have a healthy pregnancy? Lets go! Show hands! Who is going to be the first brave one?

1: I'm happy to be first one, thank you very much. You are eating for two when you are pregnant, so eat important things for healthy baby, and take care of your cravings.

2: I will be second brave one please.

Moderator: I like it! Ofcourse, please

2: eating good ofcourse important. But, I also like walking and squatting everyday when I am pregnant. Sometimes I do it first thing in the morning before I go to work, gives me good energy. Or before sun go down after work. Helps me with stress and give me some energy to cook and spend time with my family before bed. Trust me when you give birth it so much easier.

1: walking is very good but not exercise especially when you start to show. You need enough rest and sleep.

Moderator: okay, any more?

1: wait, how do you find the time anyway?

3: when do you wake up, who get the children ready in the morning?

1: when I am back from work, I am dead. You make it sound so easy sister.

2: my husband know when I am pregnant is his turn to get the girls ready in the morning for school. Its more for him because if I get me time I am in better mood because when you pregnant you know you can loose it sometimes in the head.

Moderator: happy wife, happy life, yeah?

1: not my husband. How did you convince him to do that?

3: is your husband American?
2: No. But he came here so young.

1: that why. That, or just whipped.

Moderator: what do you mean?

3: men back home not his business your are pregnant. Bring your mama over to help you. But its not right to say that, more and more men changing.

Moderator: would you say that is one of the things challenging during pregnancy?

1: you get used to it. Your man will always be like another baby to take care of. Would be nice to help, I'm just saying.

3: its expected of them to be this way. But a lot of men are better than we think, they don't get credit or invitation to be different.

1: but its easier if your family around anyway. Because then your mom and sisters will come around to help you cooking and cleaning. But I have friends who their husbands take walks with them and help in the house.

Moderator: I understand, great points. What else is challenging during pregnancy? 4?

4: everything.

Moderator: I know that is right. Give me some examples.

4: all of my body hurt when I am pregnant. My hair, my eyebrows, my nails, my feet. Never ends.

2: some woman are annoying when they are pregnant because its easy and they rub it in your face. Stop lying.

4: I think some of us stress more than other women.

Moderator: what do you mean?

4: some of us have two jobs, some women don't. some people have car or if you have car, insurance is crazy in Florida. Most of us take the bus, commute to work and home is more than one hour. Am I talking a lot?

Moderator: no please go on.

4: okay think about it. You can want to be healthy all you want, is just wishes. The real life is a different story. Eating healthy food is very expensive. In other countries everything is seasonal, organic. Here you can't trust anybody.

2: can you believe it. Its cheaper to have a cell phone than to buy organic.

1: yes, there are so many ways around it, buying cell phone on craiglist or ebay maybe or whatever, you can find deals. But organic, no way around it.

Moderator: okay, I am with you on that, one hundred percent. I am very impressed with you actually. I love this topic, we can talk for hours about this but we are on schedule, so lets move on to talk about how did you obtain your pregnancy information? Think about your first, second, and third trimester?

2: the first pregnancy is the hardest you know. Is a learning experience.

3: by second pregnancy is better, you know more. Learn quick doctors and nurses useless.

2: waste of your time. Our parents take care of themselves, the knowledge is in the community. You coming here, you want to be part of the modern life. Is a hustle mama. They tell you all these things you need that you don't need, or something wrong with you to charge you for tests you don't need.

4: you cannot trust anyone. Common sense, our grandparents and parents done it before. We are even better, we have technology, information is powerful.

Moderator: what do you do?

4: in my second pregnancy I was smart. I go to library every Saturday. I finish work early and library right there by my work. Is free. I google all questions I have.

2: I did a lot of googling on my phone when I was pregnant. Sometimes my husband help too.

3: I only google if after I ask my mom or sisters first. I ask my friends too who had children. Google is last option.

1: sometimes you go look online, you get confused more than before. Too many information sometimes, I don't know which one to understand. My English is good, I think, but sometimes is hard to understand fancy professional words.

Moderator: so, where did you get your information from?

1: my mom, friends, sister.

4: I agree with that too.

2: my favorite is when get togethers, you can have really good talk with women, you share advice and tricks, not just about pregnancy, but everything.

Moderator: okay, you are amazing so far, thank you. Now next, lets talk about relationships. Continue to reflect on your pregnancy experiences in the US as an immigrant, like you've been doing so far. I think we've covered a lot about relationships under the topic of pregnancy, so that should keep this section of the questions short. So, think about whom do you most often communicate with in the US or your home country during pregnancy and what role these relationships played in your understandings of pregnancy. Then, answer this, what are the strengths and weaknesses that might at times make one take precedence over the other?

1: okay, okay. I can see that. I love my mom, I don't know what I would do without her ever especially when I get pregnant. But, just there are some times she really get on my nerve and stress me out because she still old school, like the thinking.

Moderator: like?

1: when she came to see me first time I was pregnant, she never been to our apartment before, right? She freaking because the floors are tile, naaa you can't walk inside your house without shoes because having bare foot on the tile hurt the baby. Actually, the bedrooms she thought were hardwood so can't walk on either. But, ma these are, you know what you call them, you know, laminate, right? Yea yeah man laminate. I'm just dying laughing, she don't know the difference.

Moderator: You mom is so cute.

1: its not cute. When my hormones are crazy, I am just not in the mood for backward shit. I love my goat, but I can't eat it, no chicken either. Because the baby inside you can only eat a baby like it. To me, that don't make any sense.

4: my mom even tells me to cook the meat rare because blood help the baby grow. What?! Eat anything that is red like red fruits because it is good blood for the baby.

3: how about eating spicy food? Is that not good for the baby? Because I believe when people tell me things like that.

1: ok, I am not sure. Doesn't sound as stupid.

4: it sounds stupid to me.

Moderator: this is my favorite and last part of phase 1. After this we will take a good break. Okay? Ready ladies? Let me remind you one last time. Reflect, think, on your pregnancy experiences in the US as an immigrant. Now, answer this: how did you use or not use technological tools like cell phones, internet, social media, and so on during pregnancy?
Lets go. 4?

4: I didn't use anything technology to help me. What if I don't think of anything?

Moderator: okay, think of.

4: I use simple things like family group chat. I skype. I google. I play candy crush, is good when you stressed. It help your brain work again.

Moderator: these are great answers. Don't be afraid if you can't think of anything. If you didn't use any technologies. That's okay. Instead think of why it didn't cross your mind to use any technology to help you with any needs during pregnancy?

2: like if we have critique?

Moderator: absolutely. Good or bad things to say.

1: okay, okay. I think I have something interesting to say.

Moderator: okay, Yes 1.

1: my friend told me to download some app, like pregnancy app, you know to use because she liked it. I don't know why she liked it because I didn't. I use it just few times but then it was just junk in my phone. i use other apps like many games, skype and whatsapp or whatever, maybe instagram. Its only to make me forget about the world or help keep in touch with family and friends.

moderator: why did you not like it?

1: things like forums you can ask questions or read questions someone else send. You can be in groups with woman the same birthing month or whatever, something like that. But big mistake if you have enough stress in your life, trust me this will bring more stress for you. Trashy, trashy, catty like bad girls club if you know that show.

Moderator: you are funny. I know it, trashy but entertaining.

2: I love that show, some woman are crazy.

1: I know right.

Moderator: ok ladies, lets focus. Why is the app like that?

1: I don't think the people who made it wanted for it to be this way. But, women are drama. They judge each other and rude to each other, mean, very mean.

4: people always rude online, how do you say? Yeah bullies. Think about it, we like to judge and gossip in real life, now its even more easy to be hating on the online places because there is no controlling. Not to your face though. We have two face in front of each other.

1: if you have a good question, no one answer, no one care. Only if you a drama queen question, like my baby daddy drama, I don't know what.

Moderator: anyone else feel the same way?

3: I tried some. But it can't keep me wanting to use it. I don't even remember what I tried to use. Its for white rich ladies, maybe if its your first time pregnant or if you have nobody or you need some entertainment drama, just saying.

Moderator: okay, good points. Can you explain to me why you think about them this way?

3: no disrespect. Its good for them maybe because you find some cute things like special dates in pregnancy, when your baby gets fingers and whatever, kicks or what that kick means. For some woman, maybe pregnant is hard, so maybe it can help you connect with emotion with your baby that you don't know him or her. It can make it more fun when you are feeling not so good, your body hurts. I'm thinking, maybe.

Moderator: but why is that not for you? Anyone can jump in too with an answer if they want.

3: yes, it is not bad. But is just not for me. The pregnant journey for me is about family, the family connection. With mother, sisters, close cousins, close friends. We talk about it, we plan it together, we make decisions together, you need each other. I'm too busy with that side of things, making memories. I grew up, you help change the young ones diaper, feed them, play with them, you help around. I don't need a pregnancy class to teach me what to do with that. I am wondering about how take care of me more because that I don't know.

2: Most apps about the baby. But, what about me? Even when is about the baby, is out of touch, you know. I am homesick when pregnant, I need a flavor of home there. Otherwise, I am just bored. It has stupid things like your baby now is this fruit size. I also want things for me, how I can manage emotion, exercise, eat good, dress comfortable, lotion, spanx, whatever to help me have healthy baby and also feel good. Also, this just funny, but help women know how to get their husband more involved since some have issues with that.

Moderator: waw, you ladies are so informative. Thank you! Lets take a break, and then come back for a phase 2, I think you will enjoy.

Co-design Workshop 2:

Group A
Buddy Network

Bad design:

3: Bad design, chat room bully/too many opinions in forums

Good design:

3: Good design. We didn't know how to draw what we thinking, you said its ok for us to just describe it. So, we are talking about a local online network. Something like the idea of a community, but online. It's a support network, like big brother, big sister or whatever.

4: Buddy social sharing network. Not forum or chat rooms.

3: You can share services like babysitting, maybe an exercise friend, share pregnancy cloths or resell cheaper, you know whatever. But, to take, you have to give back. It doesn't have to be back to the same person. But, you can't take without giving, or you can take and then it count as credit, and you can't redeem another favor until you gave something I don't know, maybe?

Group B: Critique

2: When you first come to this country, something like this is really good. Also, its hard when you are not with your family and need help. Even if you have a man, maybe you feel like a single mother. Its good if a group of women want to help each other walk or run, like exercise, and anything else. I don't know what I would do when I first come here, you know, if I didn't have connections like kind neighbors or kind people in the church. It makes a difference.

1: Its like meet up, or craigslist?

3: No, its more intimate, because you subscribe to a community you live in. Maybe through local organizations connecting you, you can choose your own circles. Some features like that.

1: Maybe its good. What about safety?

3: We are thinking this is organized by community leaders, organizations, churches. So, then this can help with safety, also now you don't have to deal with online bullying.

Group B
Unlock My Pregnancy

Bad design

2: Bad design. No end to the list. Its not nice asking doctors and nurses questions. That's one. Its not nice trying to call or talk to people comparing advice, trying this and that, maybe it work may not work. Its not nice looking online and can't understand anything.

2: Good design. Maybe we thinking something like a blog, online library, uh like screen share pregnancy profile.

1: We want to call it unlock my pregnancy.

2: A better app, something is like you, like mine, you know. Its for you. So, if you put your due date, then it start to put everything you need to know, week by week in every trimester. Not all at the same time, because then its not too much going on, more organized, and you stay curious, you want to keep checking. Is like #currently, you know what I'm sayin?

1: we feel is important what is being put online for every week. We hate reading and reading and language is very medical. Our suggestion, one, short videos, one minute maybe 30 sec, something fun and short. For example, short gym moves to do at home, tips, relaxation, facts, whatever. Bring fun people who speak language the average human can understand. Not boring people like science and doctors. Two, suggestions because its smart it gets to know you maybe from what you click or look and whatever. Easy to start to use right away, no quizzes. Three, you can sync whatever you want to your phone, your social media, your group message. You can screen share with any family or friends you want. You can chat with any family or friend you add, live skype or save your video for them to see your video message later.

2: with pregnancy emojis

1: yes that too.

Group A: Critique

3: everything in one place, organized, not boring. Short videos fun, you can watch flexible, when you are in break, in bathroom, whenever really. Its nice you can share with family or friends and sync. No need for strangers and negativity in the pregnancy time.

4: Yes, my suggestion also, lets do thumb up thumb down kind of thing. So you know what the people who care about you think, and you don't have to ask them about every single thing when there is time difference or we busy. You know I would be curious, I would feel better too because I have companions with my decisions. Maybe you have contributing days like #familysundays or #husbandsmonday. You see how I sneak that in?

3: also, it will be good if you can pick language, also have recipes with ingredients you like from your country. Also, nice if I can edit and move around how I like it. Pregnancy emojis is funny. I think that is what we have. Is good.

Focus Group 3:

H: In your opinion, what does it take to have a healthy pregnancy?

1: You mean like don't drink and smoke cigarettes?

4: obviously

H: You tell me. I'm just looking for your thoughts.

1: What else there is? It's not so difficult.

4: Well, it's imperative to exercise

1: So you can hurt the baby and yourself doin silly yoga like them white lady?

4: Perhaps

1: No thanks. I have 3 children and I didn't do none of that.

3: I heard about exercising but my feet hurt too much after work and then I have to cook and clean. My sister helps but I'm just so tired! Haha

4: You have to think about yourself more imperatively. Keeping stress low, exercising, and eating clean will keep you happy. My husband is very supportive and helps out even when my mom is around. He's American though. My first pregnancy didn't work out well with my ex. Men back home are just…..well let's just say different.

1: Must be nice. My husband like a ghost. He drink his beer and watch the tv without lifting na finger to help. Typical man. My mom flies in each time to help and he can't be bothered. I don't need him anyway. What a man know? Na cook, na clean, na watch his own children to help me. Like I say, my mom help and sisters from church help out too but they gossip too too too much, all in everyone business. Did you hear this girl do this? That man do that? I dun have na time to be stickin my nose in da people business. I know they be talkin bout me too. Mmmmhmm, think I dun know…..but I do. (Nods head)

H: Is that what you find challenging during your pregnancy? Or what was challenging during your pregnancy?

1: Yes! People drive me mad! I already dun have na time for na funny business but when I'm pregnant, Lord give me the strength to deal with people! (All laugh). And work drive me mad too. Askin too much from a pregnant lady. I have to take breaks more, not just restroom breaks ya know. I feel like it's too much sometimes.

3 : I know what you mean. I have to be on my feet most of the day but I just can't do it! I tell my boss, "I'm sorry, I need to sit down for a while". He act good with it, but I know he think I'm trying to play. But hey, I think the Lord for having a job to pay these bills you know?

H: Good. Does anyone else have anything to add?

4: Personally, I find it challenging to do anything fun. My husband and I are always trying to be active and socialize. The problem is that I just don't have very much energy. My husband tries to make up exciting things to do at home but I get so bored being cooped up. And don't get me started on finding a flattering outfit to wear!

H:Great. Let shift gears to information. How did you obtain pregnancy information

1: Mom

4: Internet…..and mom

3: Sister

H: Okay. Can you explain?

1: I call my mom and ask her anything I need. She comes to help after six months. Who else am I supposed to ask? I ask the nurse at the clinic and she turn her nose up at me. The doctor dun speak in a language I understand then push me out. My mom know me, take her time and give me da special herb I need for what I need.

3: agree. I'm single so no man to ignore me but my sister help me whenever I need her. I call and text her but later on she come to stay with me.

4: I video chat with my mom but she is so assertive. I do google searches all the time and find what I need most of the time. The conundrum is that there is too much to reach and search through. It takes a long time to find information specific to what I need. Furthermore, it's difficult to find who to trust precipitously.

H: 2, do you have anything to add?

2: Not really. I feel as if we covered most of it. I use the internet when I lay down with my iPad but for quick questions I just ask my aunt. The wait at the clinic is too long plus the nurses are too aggressive.

H: I heard a few of you mention using internet or iPad. How did you use or not use technological tools like cell phones, internet, social media etc during pregnancy? 2?

2: Well I guess I just play candy crush and read what my friends are up to on social media.

3: Haha girl I be addicted to finding out what's goin on! I love lookin at the pictures and tweets while I'm sittin at home fat and lazy! Haha

4: I update my instagram all the time. I post me cravings and baby clothes and things that get me emotional. I use pregnancy apps as well to write what I'm feeling like a journal. It really helps pass the time.

1: Yea, I bet. Postin pics of how perfect your life is and how you happy all the time must fool most people….when in reality you fat, miserable, cramping and crying all the time for na reason. Why do people lie and make tings up?

H: Perhaps everyone's experience is different. That's what we're here to discuss.
1: Then tell me why Miss Perfect over her is sayin that she post everything? I bet she post nothing bout her first baby with her other man!

3: Wow

4: Well…I….uhh…

H: Now ladies, we aren't here to attack or judge, we want to keep an open and civil dialogue.

1: I'm just sayin, be real.

4: I can post how and when I want imperatively. I don't have to share everything so I don't.

H: Okay, okay. Let's change gears. How else do you use your phones, tablets etc with regards to pregnancy?

H: 3?

3: Aside from texting and video calling family, I use my tablet to try and find answers to some questions.

H: For example?

3: Haha. Like personal stuff…

H: Can you be a bit more specific?

3: Sex damnit! Haha [Group laughs] Now I gotta be real. I be doin searches to see how I can, you know, scratch that itch.

1: Mmmhmm, tell it girl!

3: I'm just sayin I can't be havin my business out there and I get nervous with the doctor, like he judging me. I already get looks because the father ain't around.

2: I get on those forums to ask questions. I try to find answers on those apps but they too general or seem like most are for dem white lady. The forums let me get more specific answers.

H: For example?

2: I don't know. Maybe like sometimes I wake up with a rash or have some bathroom issues. I can ask about all that and not feel embarrassed because nobody know me. Most of the pregnancy websites are too general. My partner don't want to hear nothing bout it and my aunt always say I need herbs but sometime she busy or sleep and I can't wait.

H: Okay, anybody else have something to add?

1: I don't trust what dem website say. People are different. I need answers from my own people, that why I ask family. All dem white lady doin the yoga, drinkin the Starbucks, and eatin like them bunny rabbit nothing but vegetables and blogs. These apps don't tell me na ting new! I dun need pictures of how a white lady baby grow in her belly! Me want rice and beans, that brown stew, and leave me be wit me Angry Bird, zen?!

Co-design workshop 3:

Group A
Pregnancy Siri

Bad Design:
1: Ya see, me problem is just findin the answer quickly, simple. I dun have time ta be googlin and searchin. Me eyes get tired and me back gets sore lookin at dem screens for too long. We showin this here bein the google and the readin that drive me mad.

Good Design:
3: Ooooh, I'm so excited about this! So what we came up with, because we feel the same way about reading in general (haha) is like a pregnancy siri. Think about how amazing it would be to have no tabs, no paragraphs to read, no nothing! Sometime you don't need all the fancy stuff. You just want straight to the point, let's go. You just talk to siri right, or whatever you want to name her, even he. Ask a question and it gives your answer back for any pregnancy question. Soooo much easier than typing and searching right? Don't

get me wrong, family is family and all that but girl sometimes I just want a quick yes or no you know? Haha

Group B: Critique

2: Wow, that is pretty cool. Okay so would it understand accents? What about languages? Would you be able to pick?

4: Pretty cool. I for one like to bookmark pages in google that I find. More imperatively, I want to get back to it whenever I think about what it covers. Sometimes I pin it in my pinterest. Maybe this siri bookmark questions that I already asked her so that I can visit that answer again. Finally, it would be nice if it shows what questions people with similar cultures and situations have been asking about and I can click them and hear what they are finding. I personally like to read but anything that will get me information faster would be monumentally useful.

Group B
Video

Bad Design:
4: We have seen many pregnancy apps out there and I have been disappointed for the most part. It lead us to use those apps with general information as our bad design example.

Good Design:
2: I'm really excited about this one. We decided to go with live video chat. You will be given choices and preferences such as: what country you are from; if you want to talk to a female or a male; age; and trimester.

4: Then based on your choices you will be connected to the appropriate volunteer healthcare professional. You will be able to have a thorough and candid discussion with them and the amazing part is that someone will be available twenty-four hours everyday. Imagine how much time will be saved by having someone available to speak with you at anytime without needing to go to the clinic.

Group A: Critique

3: Yes! We love it! It's convenient. And you can speak in your language so you can communicate your questions better and answer any background questions. Our concern also is what if someone's not comfortable with face to face with a stranger. Girl, you already know I be shy when it comes to that stuff we talked about earlier. What about maybe having other options available like regular chat.

1: Or voice texting or just voice chat. I already say readin and typin is not what I want but a real person to answer the question's nice.

3: Another concern is are they always available? I know you say 24/7 but really? What about waiting time? If you get problems like this without a plan people will get discouraged to use it.

1: Mmmhmmm. And what about if you dun like the professional lady or man you talk to? Can I choose another? What if I like them? Can I choose the same each time I use this? I think it will be nice to have the same professional every time. I will be willing to wait for them to be available if now I have a comfortable relationship with them, I feel like they know me, they actually know me! Now I don't have to be stressed.

3: Oooh, also, is it free? Girl you know no one will want to use it if we have to pay. Then again, I guess it depends how much and for how long. I mean it is our health we talkin bout. You already know if people pay for that Kim K app they prally will pay for this! Haha (all laugh) Just sayin.

Appendix D Co-design Sketches

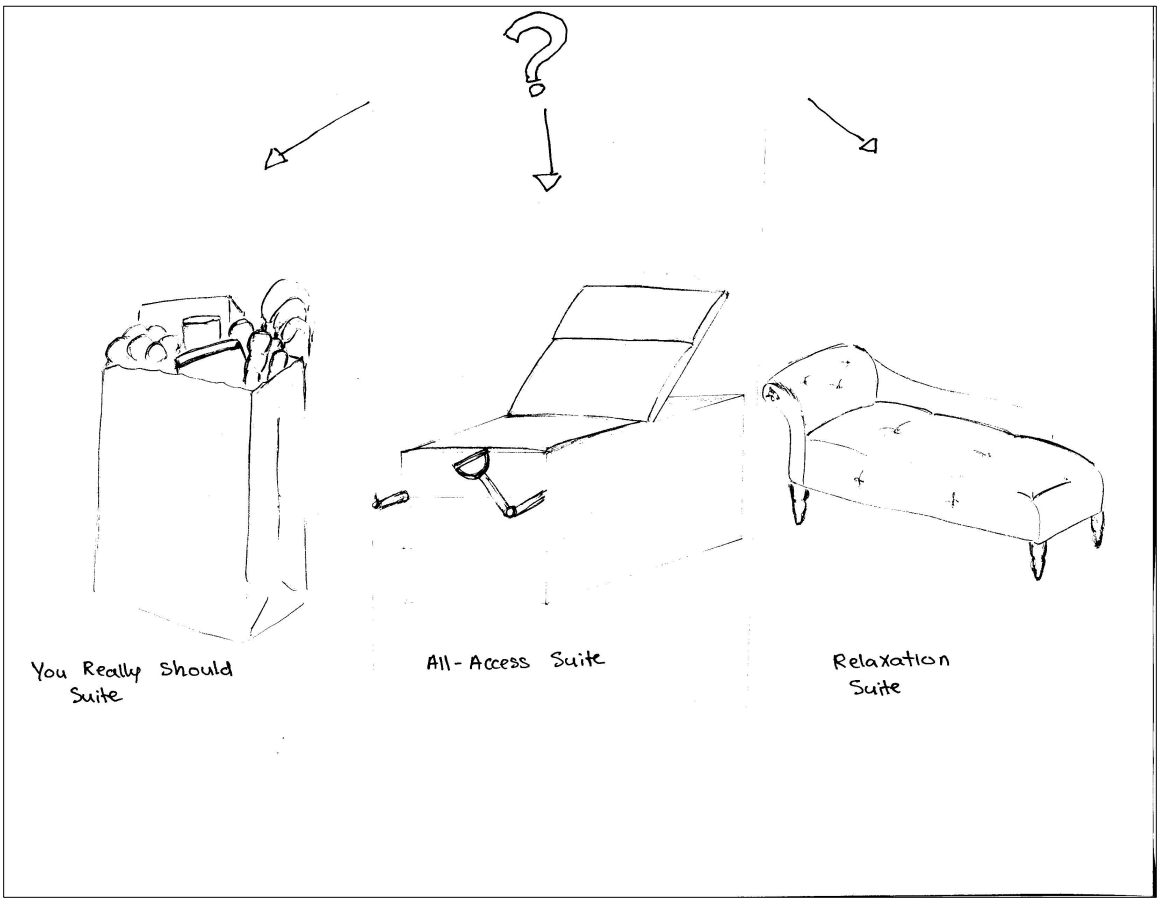

Figure D.1 Virtual Clinic

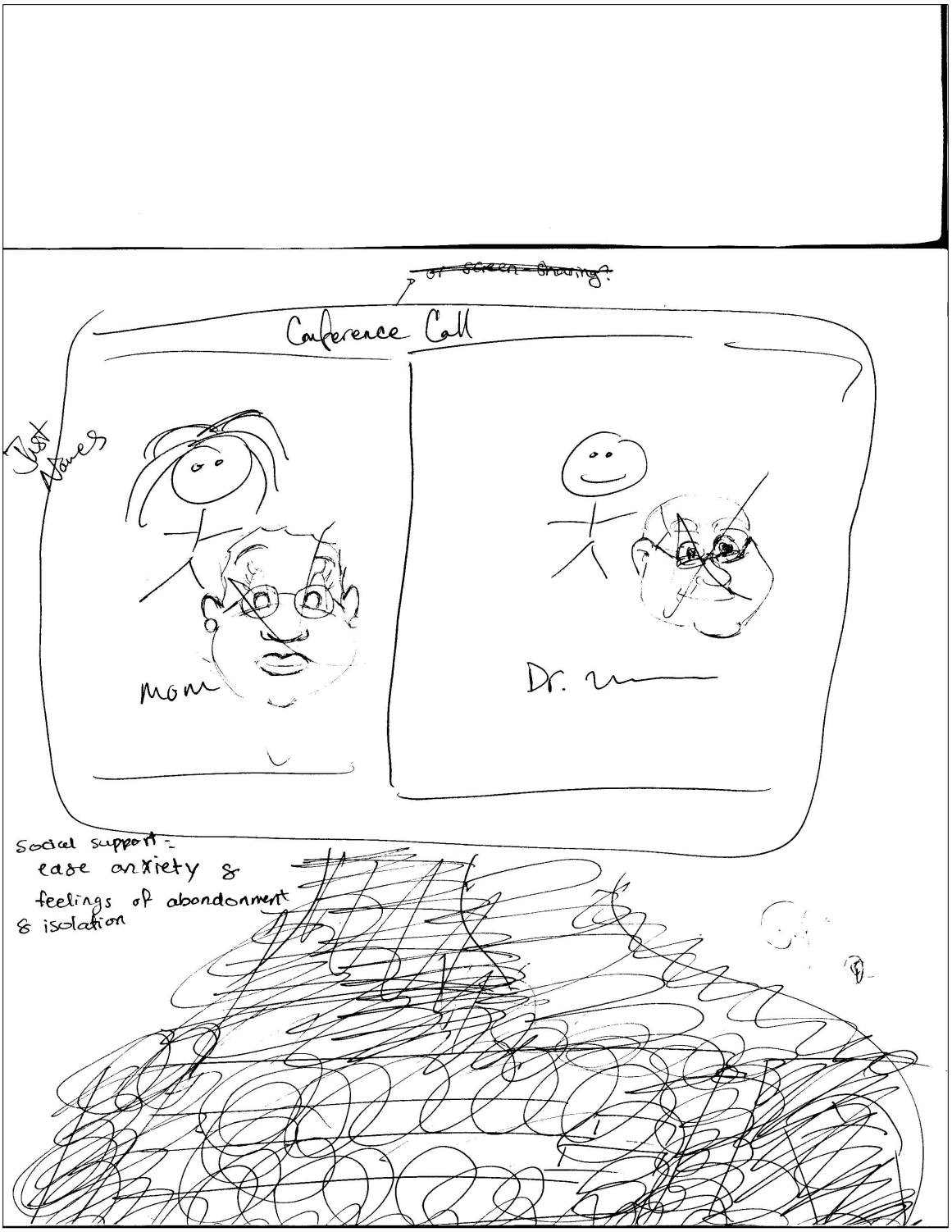

Figure D.2 Conference Call

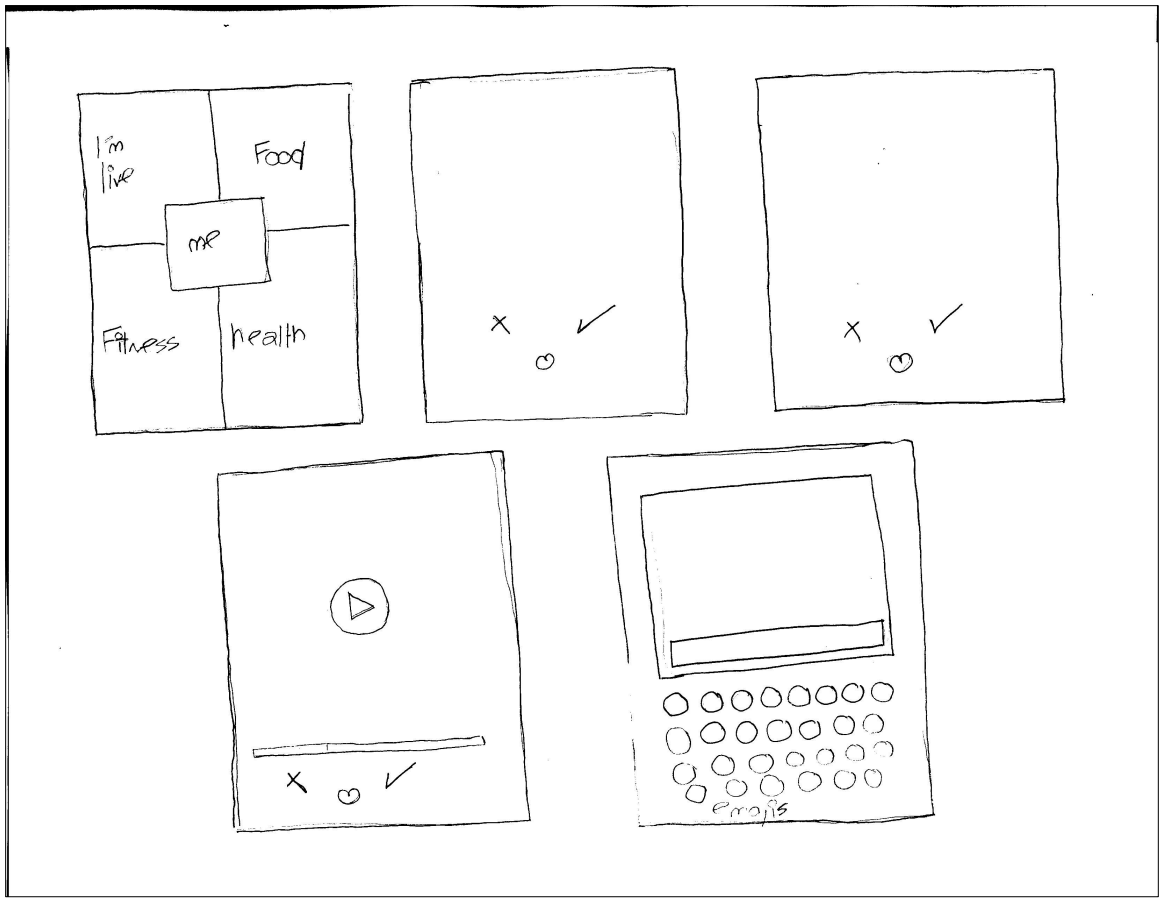

Figure D.3 Unlock My Pregnancy

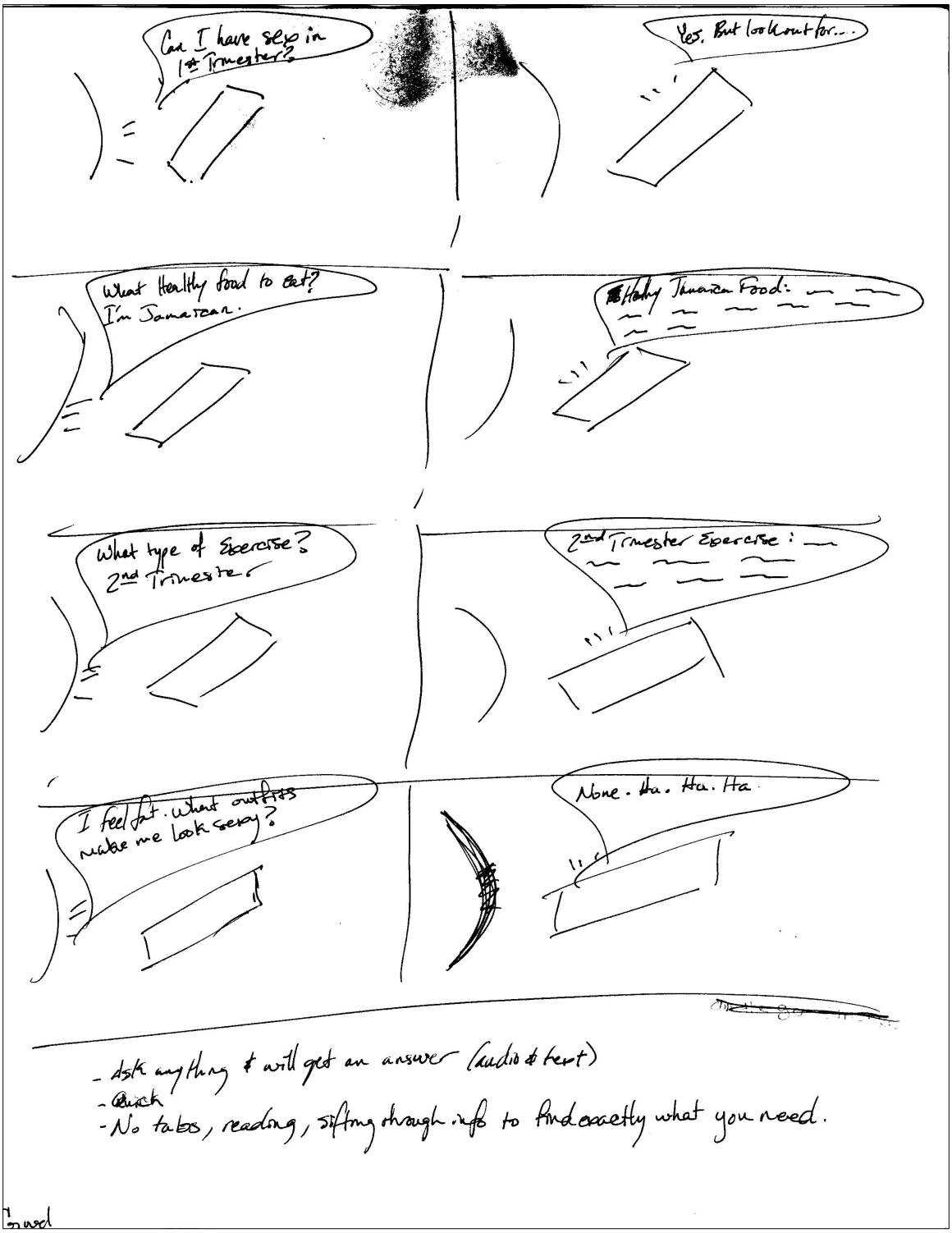

Figure D.4 Pregnancy Siri

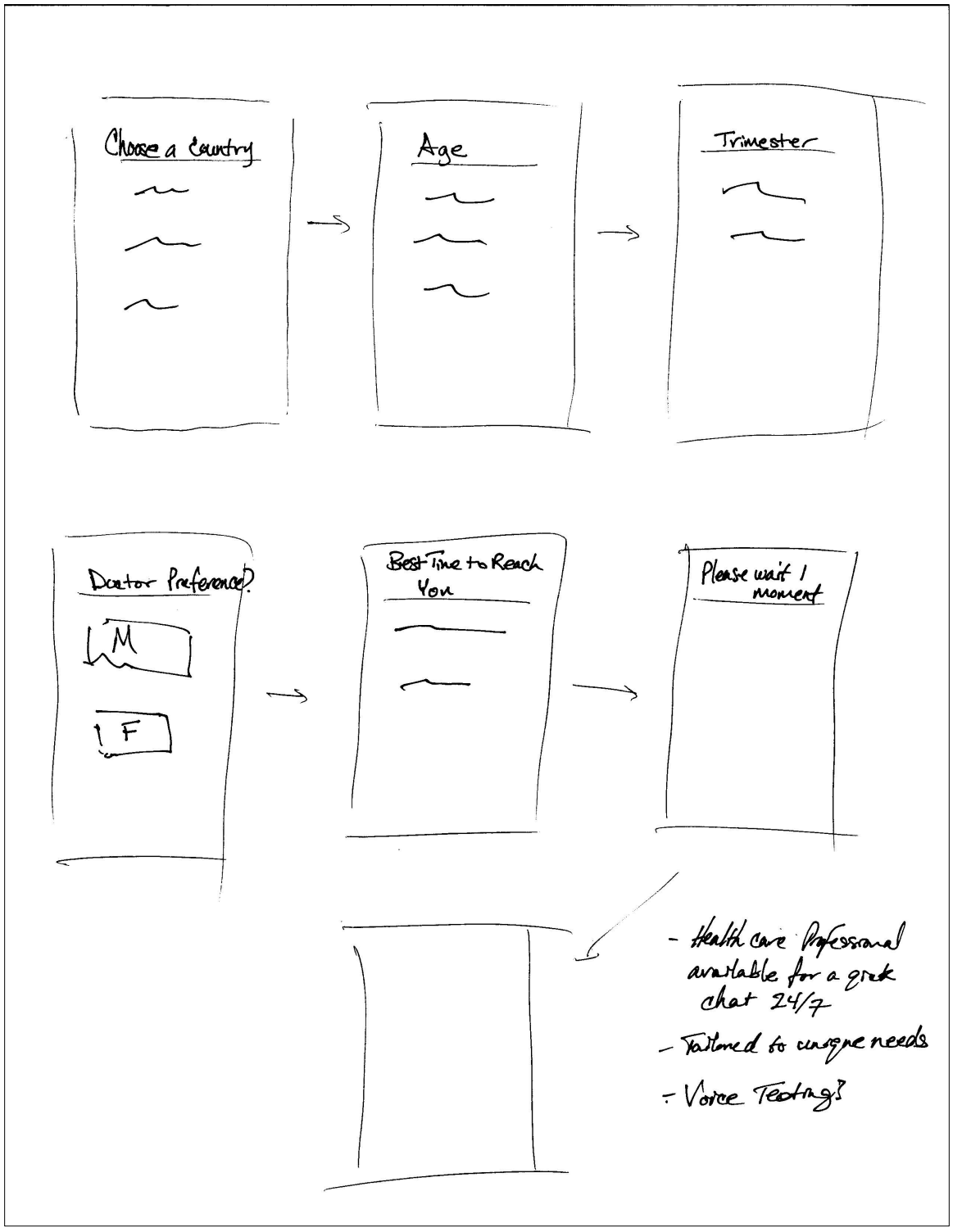

Figure D.5 Video Call

VITA

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