

**Mobile Phones for Reproductive Health Care Information:
Reviewing Mobile Health (mHealth) from Gender Perspective in
Sub-Saharan Africa (SSA)**

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A thesis submitted in partial fulfillment of the requirements for the Degree of Master of
Philosophy in Gender Studies

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2017

Abstract

This review highlights the major reproductive health problem affected positively by mobile health (mHealth) interventions in Sub-Saharan African (SSA) countries. Besides the study analyses the indirect gender impact embedded invisibly in mHealth use concerning the reproductive health care. The two central focus areas stated above is reflected from the gender concern in the study such as how women make sense of themselves in the existence of masculine norms and ideologies while using these mHealth services. These two central areas are treated independently in the study due to the limited coverage of mobile phones, reproductive health, and gender issues altogether in a single study. To inform whether or not gender issues are integrated in mHealth interventions concerning reproductive health care via mobile phone use in SSA, thematic analysis of ten journal articles and two reports were carried out. The findings from these 12 studies have shown that toll free hotline, SMS based reminder system and information for reproductive health care have improved reproductive health knowledge, antenatal care, and the skilled delivery to some extent but aren't challenge free. Likewise, this review found that the use of mobile phones functions (especially SMS) effectiveness relies on women's ability to digital literacy and the knowledge of the local language in text. Similarly, this study analyzed the related challenges accountable to mobile phone use concerning mHealth effectiveness. The thematic analysis summarized that there is an increase in numbers of pregnant women opting for skilled hospital delivery to avoid the unexpected complications. Skilled delivery was found helpful to minimize the avoidable reproductive health complications through reduced infant mortality and improved health of both mother and baby during and post pregnancy. As a result of mobile based information, pregnant women were able to decide for their own body by taking prompt action for their reproductive health. Likewise, except family planning issues, the direct participation of men in reproductive health matters was not reported which offered the chance to investigate men's invisible attitude towards sexual and reproductive health issues. These 12 studies, however, doesn't elucidate the gender issues in detail, I dug out the concern of interest from the scattered gender concern here and there. The limited availability of data on mHealth in reproductive health care and gender issues make the gender studies gap visible in mHealth studies. The eligible 12 studies selected for review address all or either of these: mHealth interventions (either SMS or Calls), gender dynamics (gendered values, norms, practice, oppression etc.), and mHealth outcome (Skilled Delivery, improved health knowledge, etc.) implemented in SSA. Thus, this study primarily about women, for the women and by the

women attempts to draw a connection between gender issues such as sexuality, patriarchy, oppression within the boundary of mobile phone use for reproductive health care in SSA. The empirical information regarding mobile phone use and gender from this review can inform the concerned stakeholders for essential transformation in order to better the situation of women concerning reproductive health care through any ICT mediums.

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(mHealth) from Gender Perspective in Sub-Saharan Africa (SSA)

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Trykk: Reprosentralen, Universitetet i Oslo

Acknowledgement

I would sincerely express my heartfelt gratitude to all who have been the part of my life journey so far. My invaluable honor to my supervisor Ardis Storm-Mathisen for patiently guiding me through thick and thin. I acknowledge my professors from whom I got to gain knowledge during my master's degree. Special Thanks to Professor Øystein Gullvåg Holter for helping me sort out confusions regarding Harriet Holter's Master Suppression Theory. I am indebted to all the faculty members at STK, the Centre for gender research for their support; it was always refreshing to see them passionate and cheerful. My sincere thanks to Mr. Pål Magnus Lykkje for finding his free time to teach me reference management system and proper database search without obligation. Also, I wouldn't like to take the data material I found in the database as granted; therefore I am indebted to the writers of all the contents that I have utilized for this study. Needless to say, I acknowledge my parents' effort and my perseverance for making it so far.

Last but not the least, my warm love to the higher power and my husband to be Mr. Shrawan Adhikari for commenting and suggesting the appropriate changes to this study.

As a dessert I thank you too ♥

Sadhana Rana

2017

List of Abbreviations

BMZ	Federal Ministry for Economic Co-operation and Development
CCPF	Chipatala Cha Pa Foni (Meaning "Health Centre by Phone" in Malawian Language)
DRC	Democratic Republic of Congo
FGD	Focused Group Discussion
GPS	Global Positioning Systems
ICTs	Information and Communication Technologies
KDHS	Kenya Demographic Health Survey
M4Change	Mobile for Change
MCH	Maternal and Child Health
m4RH	Mobile for Reproductive Health
MRHI	Mobile Reproductive Health Information
mHealth	Mobile for Health

POPIN	United Nations Population Information Network
PICO	P Patient, Population, or Problem I Intervention or Exposure C Comparison or Intervention O Outcome
PWC	PricewaterhouseCoopers Private Limited
RMNCH	Reproductive, Maternal, Neonatal and Child health
SAP	Structural Adjustment Program
SSA	Sub Saharan African
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization
UOI	University of Illinois

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1. Background and Introduction

1.1 Reproductive Health Background in SSA

Reproductive health concerns is an urgent issue that demands a valid address in Sub-Saharan Africa (SSA) and developing countries. Sexual and Reproductive health is a term that covers maternal health, safe motherhood, safe delivery, family planning, responsible parenthood, abortion and many other aspects of human sexuality and wellbeing. Reproductive health does not merely encompasses the biological and medical issues but is an amalgamation of cultural and psychosocial factors not limited to the health sectors alone. Poor sexual and reproductive health is a consequence of ill-development parameters associated partly or wholly with marginalization, poverty, gender, inequity, and inequality, unwanted pregnancy, abuse, exploitation, inability to decide the preferred time for the desired child, etc.(POPIN, n.d.). Despite the risks associated with unprepared family planning, childbearing and motherhood culture put much pressure on women to bear children (Roush et al., 2012, p.789).

Sub-Saharan Africa(SSA) that makes up 11% of the world's population carries 24% of the global disease burden while accessing only 1% of general government health expenditure (Unit, Economist Intelligence, 2012, p.13).Nigeria, for instance, represents the SSA countries with the highest maternal deaths estimated around 40000 mortalities in 2014 (Omole et al., 2014). Even though Nigeria has less than 2% of the world's population; it is accountable for 14% of global maternal death (Omole et al., 2014, p.2). The numerical figures as stated above points that reproductive health is not only the personal issues but also the concern of political, social and economic development. An emerging body of literature shows that people in SSA have begun to use a mobile phone for several health-related purposes. The numbers of online documentation indicate that the increasingly high number of mobile penetration along with the introduction of numerous mobile related health services possess the potential to empower communities in seeking health care in the least developed countries. For example, A toll-free hotline named "Ligne Verte" was tried in Congo to access the family planning information (Corker., 2010). Likewise, the SMS based mHealth facility called "RapidSMS-MCH" was conducted in Uganda where both pregnant women and community health workers used SMS to improve access to antenatal, postnatal care, institutional delivery, and emergency obstetric care (Ngabo et al., 2012). Similarly, "Project Mwana" uses the mobile technology to improve

early infant diagnosis of HIV in Zambia (Partnership Profile, 2012). Even though the pieces of evidence from the online sources display the increasing use of mobile phones by women for reproductive health purpose in SSA, only a few of them have highlighted the gender analysis of mHealth on reproductive health care. The significance of mobile health and its importance, besides communicative function, are being studied and experimented as pilot studies to offer health information in a low-resource setting like Sub-Saharan Africa (SSA).

1.2 What is mHealth?

mHealth is the use of mobile communications for health information and services to improve health outcomes (Nacinovich, 2011). The use of different applications of mobile phones such as SMS (Short Message Service), calls, apps, etc. to offer, seek and receive health can be understood as mHealth. mHealth (the use of mobile technology for healthcare), is being widely embraced because of its innovation, cost-effectiveness, and ability to deliver health information and services to remote locations (Obasola, Mabawonku, & Lagunju, 2015). Recent Data shows that mobile technologies are improving the health and wellness in the lives of patients around the globe (Nacinovich, 2011, p.1). mHealth is "a medical and public health practice with the support of mobile phones functions such as patient monitoring devices, personal digital assistants (PDAs), and other wireless devices" (WHO, 2011). Correspondingly, World Health Organization (WHO) in collaboration with Johns Hopkins University, United Nations Children's Fund (UNICEF), Global mHealth initiative and Frog design outlines 12 frameworks for the mHealth application (Labrique, Vasudevan, Kochi, Fabricant, & Mehl, 2013). Those applications areas are:

- I. Client education and behavior change communication,
- II. Sensors and point of care diagnostics
- III. Registries and vital events tracking
- IV. Data collection and reporting
- V. Electronic Health Records
- VI. Electronic Decision Support
- VII. Provider to provider communication

- VIII. Provider Work Planning and Scheduling
- IX. Provider Training and Education
- X. Human Resource Management
- XI. Financial Transactions and Initiatives

Due to the diversification of data (articles) selected for this study, it's not possible to tie this review strictly under above applications. Even though these mobile health applications are not studied here, the reason behind mentioning these applications areas here is to provide the glimpse of interconnectedness and broadness of mHealth area where each of these applications demands a comprehensive study. Out of the applications listed above, the mHealth initiatives selected for review in this study are closely related to client education and behavior change communication. mHealth thus requires more or less developed Information and Communication Technologies (ICTs) systems and tools that facilitate communication and the collection, storage, processing, transmission of data and the sharing of information by electronic means (L'Engle, Raney, & D'Adamo, 2014). The medium of ICTs can include e-mediums such as radios, televisions, telephones, telemedicine devices, wireless devices, etc. mHealth, therefore, falls under one of the mediums of e-health under an ICT umbrella. Among the most commonly used technological tools for the delivery of mHealth interventions are ordinary mobile phones, smartphones, tablets, wireless devices, sensors, biometrics and GPS (Olla & Shimskey, 2015). Cellular phone functions such as SMS, toll-free, voice call, imaging, on-demand content creation, etc. can be convenient, practical, and feasible regarding reach to collect and disseminate information for reproductive health. mHealth can be useful to escape the avoidable complications brought by an inability to access reproductive health care information.

1.3 Limitations of the Study

Sub Saharan Africa is a vast region consisting of 49 African states out of 54. SSA having the highest population growth in the world is a home to one billion people (BMZ, 2017). Among all these countries, only a few countries are selected as a representative of SSA. The selected limited countries are the ones where most of the mHealth studies concerning reproductive health care are done. The studies chosen from these SSA countries reflect the gender dimension of mHealth use in a partial manner. Besides gender and sociocultural aspects of

mHealth, numerous mHealth related issues pop up to fit in the context which seems equally crucial for the study. It's indeed complicated leaving them aside as including many issues may divert the study from its aim. To name a few, cost-benefit analysis of mHealth projects, availability of skilled workforce, availability, and supply of medications, cooperation between mHealth workers and mHealth system developers, mHealth software designs, unforeseen challenges, etc. are not addressed in the study. To try to detach these factors were challenging as it would fit into many aspects of the research in this review. Except the frameworks directly associated with the study objective, all other mHealth frameworks as outlined by Labrique et al. (2013) in the background section above are intentionally ignored. Considering the time and relevance, the study attempts to be concise and comprehensible by excluding too many facets of mHealth.

2. Aim and Research Questions

The study aims to present the impact of mHealth interventions concerning the significant reproductive health outcomes that have been addressed efficiently by mHealth in SSA. Likewise, the study seeks to find out the gender response or impression that mHealth use on reproductive health care expresses in few Sub-Saharan African Countries. Among many reproductive health concerns, maternal health is picked as a representative to assess the performance of overall reproductive health care systems in SSA.

Men as a partner or spouse, their contraceptive behavior, preferences, and decision making affect the woman's reproductive life. Therefore, the mHealth inquiry to family planning is also linked to an associated reproductive and sexual health concern as it directly involves men as a partner. The preference of women and men in the use of the mHealth reproductive care can reveal a lot about gender relation in SSA context. Thus, the preferential use of mHealth for reproductive health care also hopefully provides an insight into some linkages between gender power relation and mHealth use. The vital areas of reproductive health care concerning women and men such as the importance of reproductive health information for sensitizing family and community regarding the reproductive health issues. The possible mHealth barriers surfacing out of mobile phone use and its interaction with social and cultural factors are also considered.

2.1 Research Questions

1. Which key reproductive health outcome has mHealth interventions addressed effectively in SSA? How can this outcome be understood from a gender perspective?
2. What gender implication does the use of either of these mHealth functions (SMS or Calls) suggest?
3. What potential barriers to effective mHealth outcome are documented in the selected studies for this review?

2.2 Problem Statement: Reproductive Health as a problem and Mobile Health (mHealth) as a solution

With the gradual growth of mHealth impact evidence, mHealth has lately gathered the optimism among stakeholders due to its potential to surpass the conventional reproductive health care system. Conventional reproductive health care problems in SSA are primarily linked to delay in seeking care. Delay seeking reproductive health care is accountable to concerns like lack of information about the existence of care, socioeconomic and infrastructural challenges, the level of empowerment of women in patriarchal sociocultural settings, etc. These challenges are responsible for reproductive health problems like maternal mortality and poor maternal health; unintended pregnancies, and men's negligible involvement in reproductive health care to name a few. Despite men using the mobile phones more than women, what disinterests their engagement in the reproductive health matters reveal the gender dynamics of mHealth use. Gender power dynamics are distinctively set and expresses in its unique form, the understanding of which can provide the tips to engage men in reproductive health matters.

"In 1994, Sreen Thaddeus of the United States Agency for International Development (USAID) and Deborah Maine, Professor Emerita at the Columbia University Mailman School of Public Health, linked causes of maternal mortality to three delays viz. delay in seeking care, delay in arrival at a health facility, and delay in the provision of adequate care (The Borgen Project, 2016). Out of these three delays, how the reproductive health care information addresses the delay to seek care from the main basis of the inquiry. The opportunity to study the latter two delays, i.e., the delay in arrival at the health centers and the delay in the provision of adequate care about mHealth in SSA is almost void due to the

modest data. Seeking and accessing to the care may sound simple enough to explore but seeking reproductive health care in rural areas takes into account the underlying social, cultural and structural dynamics like education, tradition, gender, etc. Seeking reproductive health care is dependent on the ability to decide. The decision making in the rural areas are usually not entirely individual; their reproductive behavior has social influence through relations, kinship, informal social networks, local political institutions, and traditions (Price & Hawkins, 2007, p.24). They further state that these factors are the product of the wider social, political, economic and historical processes.

No initiatives are without barriers and the ability to permeate barriers can confirm the success of mHealth. Understanding mHealth barrier further triggers the need to address the barriers for a reliable mHealth outcome. Therefore, I also want to present the barriers that I come across while exploring the aforementioned research questions. It provides a glimpse of what kind of challenges ought to be addressed to encourage the gender-integrated mHealth programs.

2.3 Finalizing the Research Question

As research questions sketch the borderlines of the study undertaken, steers the data collection and data analysis, it is of paramount importance to give it an unambiguous purpose. Presented below is the brief account of finalizing the research questions for this study. The reason behind mentioning this procedure here is the modification of research questions multiple number of times due to the inappropriateness of the data material. Mobile health and Gender as a newly emerging dominion is known to many. Exploring the arrangement (i.e., not why but how things are as they are) of gender roles and mobile health use updates new gender perspective to the gendered side of technology. Besides exploring mHealth approaches, settings, and their effect so far, etc., observing gendered set up in mHealth use could produce relatively new knowledge that could be significant for future mHealth related interventions. The gender issue concerning mHealth use allows us to interpret the existing gendered practices within the realm of the mHealth intervention and its use.

I checked ample of studies to check if my research questions match with other studies. Fortunately, I didn't come across the research questions directly address mHealth and Gender. Likewise, the availability of the mHealth research from the gender perspective is also relatively small. Once I had tentative research questions, I underwent the preliminary

scoping of literature for the careful identification of literature matching the research question as mine to avoid the duplication. The review questions in this study are both exploratory (being acquainted with a phenomenon to know the object better) and normative (relating to, or deriving from a standard or norm, especially of behavior). The careful literature search uncovered that there are no studies published yet regarding gender analysis of mHealth evidence in SSA. Besides, there were limited published articles to answer my research questions based on Sub-Saharan Africa. After refining the research questions again, my journey began to search the potential literature and data material addressing the research questions. After doing the final literature review, I finalized these research questions after dumping the first round of research questions as only negligible data resources turned out to address the research questions listed above.

2.4 Significance of the Study

This study attempt to bridge the literature gap persisting between the impact of mobile phone use to reproductive health care information and gender in SSA. This literature review analyses the impact of mHealth to get reproductive health care information while standing on several previously done studies linking women, men, and mobile phones. Besides fulfilling the literature gap, the consideration of the challenges and issues stated in this review can have practical benefits for the existing and the potential mHealth users in Sub Saharan Africa. This study also highlights the issues concerning women who are not able to benefit from mHealth services due to factors like education, level of awareness and information, the presence of some preventer and ability to tackle related barrier, etc. Despite the implementation of numerous government programs to address the reproductive health care, the effectiveness of plans and policies seem reliant upon the ability of users' side, i.e., the information the pregnant women and her community have regarding the procedure to seek the health care and its access. Thus, this study can also sensitize local policy regarding improving the social infrastructure to make the mHealth interventions more effective especially among the disadvantaged one.

Besides highlighting the potential of mHealth to reproductive health care information, the study sheds light on related challenges which demand the solution for an effective impact on mHealth. I have presented the map below by PricewaterhouseCoopers Private Limited (PWC) to show how many lives mHealth can potentially save in many countries of Sub-

Saharan Africa (PWC, 2013). The picture also provides the hint regarding the figure of people who could be the potential users of mHealth. Though these kinds of projections are always susceptible to reliance, these figures, however, provide some glimpse of the probability and potential of mHealth interventions reach for needy people.

Map 1 PricewaterhouseCoopers Private Limited (PWC) estimation showing the number of lives mHealth can save in many countries of Sub-Saharan Africa



Source: Connected Life, PWC (PricewaterhouseCoopers Private Limited), 2013

2.5 Analytical Perspective

I applied Harriet Holter's master suppression technique as a theoretical bedrock to bring into light the hidden gender power dynamics embedded in mobile health initiatives. Building partially on Ingjald Nissen, the Norwegian psychologist and philosopher, Harriet Holter pioneered the gendered master suppression technique. Later, Berit Ås, the Norwegian social psychologist, and politician popularized the social psychological version of master suppression technique.

The reason behind the interest in studying power relation is the poor visibility of power relations that prevail there in disguise in the operation of mobile health initiatives. That is the interaction of mobile health services with the women's prevailing social situation suggest the address in the gender power relation and broad governance condition. However, the gender power dynamics between men and women are relatively visible than the power relationship between an institution and an individual. In addition to the invisibility of power relation between individual and institution, these powers relations are complicated to address as it's hard to identify as to who is to held accountable. I used Harriet Holter's master suppression technique as an effort to substantiate the findings of the study. By Master Suppression Technique, she means the oppression structurally embedded into the system where it's hard to point out a person who exercises the oppression. Women are the targeted user of mobile health in the mHealth initiatives selected for review in this study. These mHealth initiatives silently call up for an integration of men who majorly represent masculinity and patriarchy in Sub-Saharan African culture. As both men and women live in a particular institutional system, the glance into the cooperation of public institutions with mHealth initiatives helped analyze the challenges for an effectiveness of mobile health initiatives.

Since women are the major user and focus of mHealth in the studies selected for review, counting slightly on the Marxist feminist idea regarding the differences of women between different classes has also added value to the understanding of the study from a feminist perspective. As opposed to liberal feminism theory which considers technology as gender neutral, social feminism (Marxist) theory considers technology as gendered. Gendering the technology and poor representation of women in technology is accountable to historical and cultural factors. According to Wajcman (1991), technology has a male bigotry and reproduces the stereotype of women as technologically ignorant and incapable. Wajcman (1991), almost three decades ago, stated that the control over technology is a key feature of

masculinity. This scenario has however changed these days as the technology ownership, and use are not quite seen as gendered as during the early days of technology inception. The concept of technology as a masculine culture by Wajcman, J. (1991) states that there are diverse cultural expressions of masculinity and like femininity, takes historically and culturally specific forms. This diversity reflects class divisions, as well as ethnic and generational differences. That is the practice of gender differences through cultural and customary expectations has given rise to gender identity issues, i.e., both male and female developed the patterns of behavior that confirms to masculinity and femininity. Wajcman highlights that gender identity is profoundly important to the perception of one's self. She states girls internalize the belief that boys possess something that they lack; and the difference is lived as inferiority (Wajcman, 1991, p.52). She thus means that conforming to gender stereotype and not accepting what technology offers to women; the girls make themselves their own worst enemy. In her other words, the emphasis on technology dominated by men conspires in turn to diminish the significance of so-called women's area such as horticulture, cooking, and childcare. She, therefore, substantiates that technology and manliness have their roots in the historical and social construction of gender that makes the patriarchal ideologies natural rather than mere biological sex difference. The mobile health initiatives in Sub Saharan Africa trying to address reproductive health issues are demanding to solve improved livelihood needs such as education. The fact that the mobile health, men, women, and community lying under the development umbrella seek both the developmental and political address. It is, therefore, the systematic exercise of power is the cornerstone of the developmental initiative like mobile health. Gender perspectives help us understand the power relations, both the personal and the impersonal one. Both the personal and impersonal power relations have their roots back in the wider social, historical and political context. This study, however, doesn't intend to delve into those historical and political contexts. I will discuss the power relations from the gender lens concerning the reproductive health in mHealth initiatives.

3. Method and Materials

The suitability of the methods are determined based on the research questions listed above. I chose the methods below to embrace the dynamism that the research questions bring along while unfolding the gender issues in the review. Two key processes involved as a method to

give shape to this study. The first step is the review of available literature to get acquainted with mobile health (mHealth) in Sub-Saharan Africa. The second process is the engagement with a detailed methodological aspect of the study stated in the subsections below.

3.1 Literature Review

This section reviews the uses of mobile phones especially through text message and calls for reproductive health care and their implication from the gender perspective. Usage of text messaging is seen more common than calls in the implementation of the mHealth product for health care. Expectations that mHealth will help to enhance access to care in a quick and easy way are big. Besides access to care, there is also the optimism concerning the conversion of costly health care into affordable, prevention and patient-centered care. The review below provides the glimpse of mHealth use, techno-optimism and the gender concern that the reproductive health address. Besides Sub Saharan African countries, examples of mHealth use from Argentina, Bangladesh Thailand is also included. For the literature review contents, I went through both the published and grey literatures. Sources of published evidences used in this literature review ranges from books, bibliographic databases, review journals to organizational reports etc. The sources of grey literature include government and non-governmental databases, Master's and Ph.D. project from universities, online news articles, hand searched blog, etc.

3.1.1 Mobile Health Utilities

With the advancement and accessibility of cellular technologies, different sectors integrate mobile phone system for solving various problems. Mobile phones usage for healthcare services provides robust organized storage and retrieval of health data, strengths and eases communication between healthcare components, mass accessibility of information sharing (Chib, van Velthoven, & Car, 2015). This kind of services has been in utilization in mobile phones over the past decade for data collection and dissemination in the developed countries. For a more convenient means of contact, healthcare professionals have been considering digital forms to get the information from the patients or healthcare consumer (Kaewkungwal et al., 2010; WHO, 2014). Likewise, mHealth services have been providing remote assistance and monitoring for instance: e-records, cost-effective two-way communication (SMS), etc. Some of the attractive features of mobile phones include the pay-as-you-go (or prepaid

phone) and the short message service (SMS). SMS is a long established medium of communication globally due to a simple transfer of data from person-to-person usually within 160 characters, but the message can also be sent in bulk and from computer to person or vice versa (Howitt et al., 2012).

Different models of applications were developed and used on various mHealth projects. Africa and Asia have received the majority of mHealth interventions in the health areas such as HIV/AIDS, family planning, pregnancy, etc. are among the most frequently addressed issues by mHealth interventions (Gurman, Rubin, & Roess, 2012). In Nigeria, Pathfinder International's 'Mobile for Change (m4Change) initiative has provided the mobile application named "Commcare" to make maternal and child health care more practicable in Nigeria. The objective was to improve quality of maternal, neonatal and child health services offered at primary health centers. Data collection via electronic forms included registration and tracking of pregnant women and new mothers through the child's first year of life. This initiative addressed low acceptance and usage of antenatal care (ANC) and delayed payments (women are eligible to receive a cash payment for ANC registration and ANC visits) by facilitating real-time data collection and payment verification (WHO Pathfinder International Nigeria, 2014).

Many healthcare facilities in Thailand developed and deployed a module combining web-based and mobile technologies tools that helped caretakers to register, track, and cross-check, verify and update mother's ANC and child's EPI thereby sending appointment reminder via SMS directly to the scheduled mother in the community. The module integrated and functioned successfully as part of the healthcare system regarding the low resource setting and practicability for healthcare personnel to perform their duties (Kaewkungwal et al., 2010). Correspondingly in Bangladesh, toll-free mobile telephone was set up in one of the sub-districts to support mothers in pregnancy and delivery period. The mHealth establishment resulted in 85% of the mother's' participation in the orientation session. Mothers learned to make contact with skilled birth caretakers through the mobile phone for maternal health assistance and 80% of the trained birth caretaker communicated with mothers for guidance on maternal health management (Huq, Azmi, Quaiyum, & Hossain, 2014). Another study on Argentina showed that the pregnant women were interested in receiving SMS and calls containing information regarding pregnancy and infant health. SMS and toll-free service are found to be best for women of low socioeconomic level in a middle-income country (Cormick et al., 2012).

If fulfilled all pre-requisite, mHealth can be a promising tool for delivering the health services regardless of the amount of content delivery, coverage and cost (SMS and call) but disregard of knowledge required for its operation. However, it's not entirely clear as to how various mHealth interventions are going to sustain after completion of initial endeavors. An intensive study has to be done to demystify best possible model for its sustainability in the long run.

3.1.2 mHealth and Techno-optimism

SSA has the least developed infrastructures in the world, the mobile penetration is very high (Aker & Mbiti, 2010). The penetration of mobile phone has reached more than 80% in countries like Nigeria. Kenya has been lately recognized as Silicon Savannah (Pew Research Center, 2015). Despite mobile penetration, infrastructural challenges still persist in SSA. In addition to infrastructural challenges in health care, people often face avoidable issues that a mobile phone could easily settle. Some instances of avoidable issues could be lack of family planning information, not getting the care information during different stages of pregnancy, etc. Trivial things like decision making and access to the nearest health centers confront health care seeking in SSA such as delay in deciding, and access to the health facilities are accountable for the absence of reliable health information systems (Combs et al., 2012). In this scenario, mobile phones serve as the connecting platform to improve decision making and ease access to health care seekers. This techno-optimism ensure that the technological innovation such as mobile phone has hope in future. Cell phones are techno-optimistic due to its easy availability, portability, and extending network coverage to connect with rural areas. The belief that mHealth improve reproductive, maternal, neonatal and child health (RMNCH) is growing (Tamrat & Kachnowski, 2012). The exponential growth of mobile phones in Sub-Saharan Africa is inspiring the use of mHealth. Eight out of nine systematic reviews of published articles on text messaging supported the evidence of the reasonably accessible, relatively inexpensive tool for health behavior change (Cole-Lewis & Kershaw, 2010). The ever-growing use of mobile phones, low costs, along with its multiple functions to address health issues makes the mHealth optimistic.

3.1.3 Reproductive Health Concerns Gender Issues

In my opinion, the emphasis on gender issues can sensitize donors to check the power dynamics, especially the systematic ones than the one existing merely between men and

women. That is to say that more politically informed approaches could help identify and address the local context for impact-oriented mHealth intervention. Unlike a person's sex, which is physiological, society's appropriation of roles and behaviors for men and women determine gender (World Health Organization, 2014). Sex marks the biological metamorphosis between male and female whereas gender is what society constructs of sexual differences: the roles, norms, and meanings they assign and therefore gender has many facets (Haslanger, 2000). The gendered expectations and affirmations for not adhering to those expectations are dependent on culture, race, class, age, and sexual orientation (Kraft, Wilkins, Morales, Widyono, & Middlestadt, 2014, p. 123). These expectations are always susceptible to modify over time and context.

Majority of Sub-Saharan African countries has been primarily patriarchal (excluding few matriarchal societies like the Akan of Ghana) for centuries (Schoola, 2014, p.4). The interventions like the mHealth struggle to transform the gender norms due to the persistence of tenacious patriarchal grip manifested through cultural values and standards. Patriarchal gender roles practiced during the colonization era are still in a custom that undervalues the gender consideration (Schoola, 2014, p.6). Therefore, there are chances that mHealth interventions can be affected by gendered attitude and practice. The study, moreover, is focused on gendered attitudes and norms in the community that is visible after people started using mobile health. Thorough database search displays noticeable research gaps addressing mHealth and gender collectively. To generalize or predict the gender dynamics (gendered norms, attitudes, access to resources, etc.) of acceptability and applicability of mHealth interventions are rather complex due to the unavailability of enough data materials. Marge Berer asserts that men are responsible for and remain at the root of many of women's reproductive health problems (Berer, 1996, p.5). The reproductive and sexual health is associated not only with male and female, husband and wife but encircles the entire family and community. Many women in Sub-Saharan Africa are still illiterate with no information and access to even technologies such as mobile phone. There is considerable female population who depend either on male or other family member's phone. In the scenario of female dependency upon the male, gender roles, therefore, can affect the acceptability and utilization of mHealth interventions. Furthermore, many communities in SSA are usually reported stigmatized by the patriarchal norms and beliefs. In Nigeria, for instance, young women seeking sexual health information are uncommon because people don't perceive their curiosity positively (Blanc, Glazer, Ofomata-Aderemi, & Akinfaderin-Agarau, 2016).

As mHealth also increase the men's access to reproductive health, it can, therefore, be presumed that mHealth can encourage spouse communication as well. This assumption, however, cannot always be true. On the other side, the spouse may not give consent or support in any form to take part in mHealth interventions due to matters of privacy, phone ownership, or any other issues. Also, we cannot ignore the possibility that the mHealth targeted for both the sexes can also be dominated by men regarding acceptability and decision making.

3.2 Developing the Inclusion Criteria

The research questions outlined the boundary to look for what to include and exclude from the available literature. First and foremost, the qualitative research studies on mHealth were prioritized. The reason for selecting the qualitative research was the suitability of the research question with qualitative method rather than the quantitative one. Jayaratne and Stewart (1991, p.223) asserts that the kind of richly textured feeling of data that qualitative study provides may not be offered by quantitative studies. But however, more than qualitative quantitative struggle, it's about how best the particular method can be responsive to the chosen research questions. Bryman (2014) notes that qualitative researchers commit to seeing the social world through the eyes of the people they study. It is therefore not surprising for many researchers make claims in their reports of their investigations about having sought to take views of the people they studied. That is many qualitative studies are concerned about what inquiry beyond the visible settings (Bryman, 2014, p.401). The investigation may contain the look into the trivial details that provide the context within which people's behavior takes place which is significant for the researcher's subjects (Bryman, 2014, p. 401). The only demerit of qualitative data as an approach is the huge chunk of data that can quickly overwhelm the researcher concerning its filtration. Since the use of mobile health and gender demand the contextual understanding and flexibility to changes during the research process, I opted for qualitative data and research respectively.

The first inclusion criteria regarding the research design are the qualitative research studies as the data material. Likewise, the PICO (problem/population, intervention/exposure, comparator, and outcome) method was partly helpful to put the inclusion criteria into perspective in the excel spreadsheet. However, only a few of all the selected twelve studies have comparator as PICO method demands. This shows that not all the articles reported

alternative subject of particular mHealth intervention to compare their outcome with. That is some of the mHealth interventions had both exposed and unexposed group with the result and no outcome. Whereas some only had exposed group and expected outcome. I figured out the proper selection of data material within the predefined inclusion context as stated in the box below:

Inclusion Context	Criterion
Population Group	Primarily Women; and Men especially in the studies involving men like family planning
Location	Sub-Saharan African Countries
Problem of Focus	Reproductive Health , especially maternal health and family planning
Intervention	Mobile Phone’s SMS and Calls
Model of Care	E-Health or ICT based reproductive health care
Type of Data	Primarily Journal Articles and Reports

Box 1 Inclusion Context and Inclusion Criteria

3.3 Literature Search and Construction of data material

My first step was to identify the studies to include in the sample as data which involved the rigorous searching. Searching is a term that is used to describe the methods by which you identify evidence to be included in the review (Boland et al.,2014). Almost all the appropriate journal articles from databases required to use either the college computer or virtual private network due to database subscription issues. Besides databases, electronic hand search for online content were also carried out. Firstly, I went through the mHealth Compendiums

(Volume I, Volume II and Volume III- please see p. 63 in references) that contain more than 85 worldwide case studies of mHealth applications just to gain a superficial idea regarding the subject. From there I found the reference to many important journal articles related to mHealth. The majority of cases were related to Africa. Since there were only brief two to three pages' information for each case study, the compendium only served to acquire knowledge about the existing mHealth projects. Selecting the studies that fit the qualitative research questions are more time consuming than the quantitative method, which usually has the fixed procedure. Established methods used for searching and identifying quantitative research do not necessarily translate into effective searches for qualitative studies (Ring et al., 2011, p.16). Within the river of broader qualitative studies, narrowing down the search is very important. Variety of electronic databases like PubMed, Science Direct, Lancet, Web of Science, Cochrane library etc. were searched using the Boolean operators like "AND" (narrows the search), "OR" (Broadens the Search) and "NOT"(Finds the searched word while ignoring the associated words with it). The use of Boolean operators controlled best to stay within the inclusion criteria set for the study. In addition to Boolean operators, Truncation symbol such as *(asterisk) is also used. The search term used are mHealth OR mobile Health OR reproductive health OR electronic* Reproductive Health OR Mobile Health Care or mHealth care or ICT Health OR cell phone* OR cellular phone* OR texting OR message* OR SMS OR Calls AND Sub-Saharan* Africa OR Africa.

3.4 Search Result

Although most publications title and abstracts sounds convincing, only very few of them contained the proper information that this study sought for. Most of the studies were focused on the operational aspect of the mHealth program. The flow diagram below presents the glimpse of filtering the articles for the data.

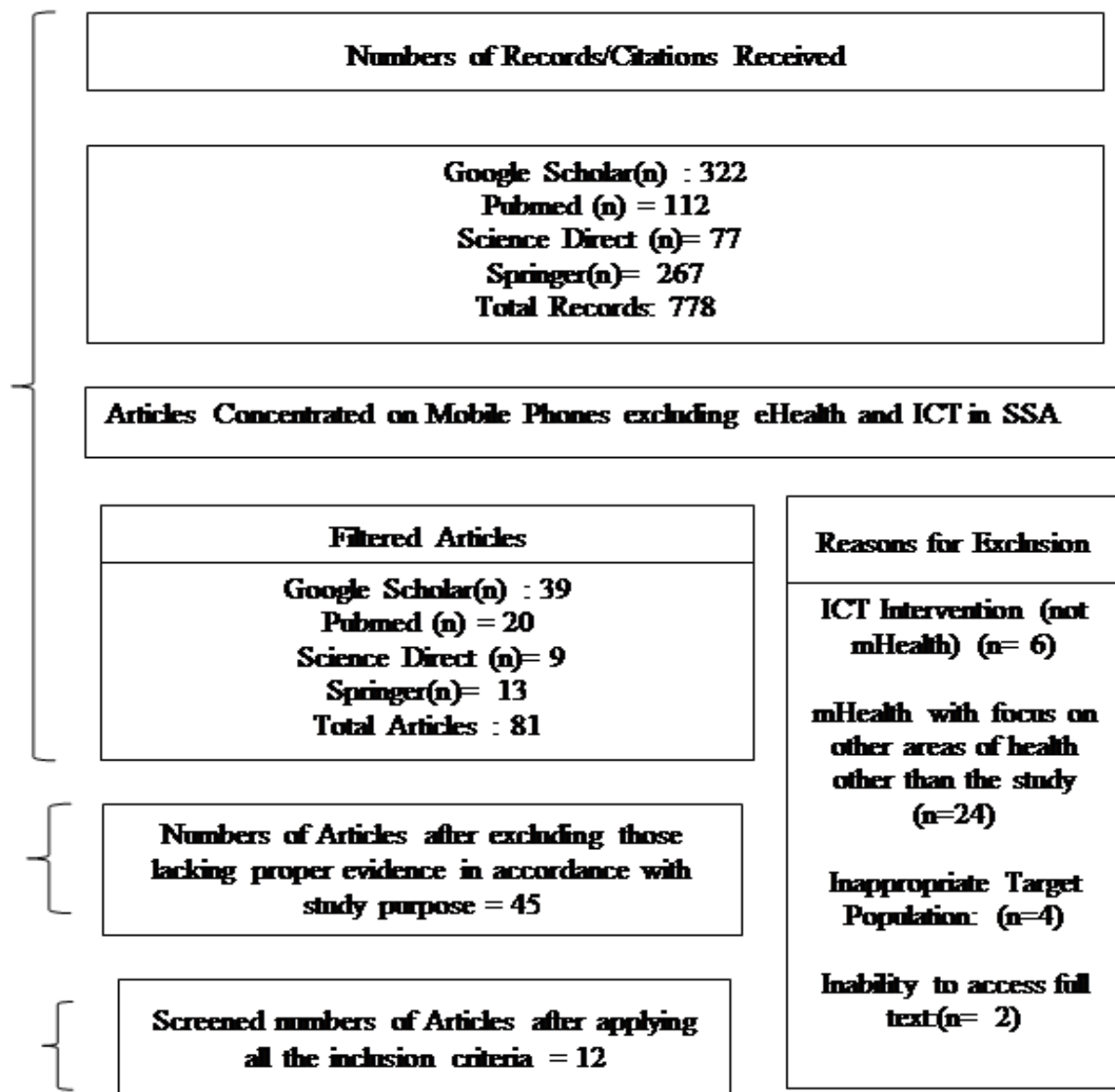


Figure 1 Screening procedure of data search

The first step is the electronic searching of literature on database. The limitation of time frame 2010-2017 for articles search controlled the large number of citations all at once. Since this study is not comparative study hitherto and now, the inclusion of older mHealth articles risks the study being too broad and distorting as mobile phones use as a technology is rapidly

advancing. In order to determine the relevance of gathered citations, they were further screened by concentrating only on mobile health, excluding e-health and ICT in Sub-Saharan Africa. This resulted in 81 potential articles. The second step involved reading the abstracts and the application of inclusion criteria to 81 articles. This further filtered the numbers of articles to 45. I skimmed through the full text of these 45 articles and those not addressing the targeted mHealth intervention, reproductive health issue, and gender/socio-cultural issues in some way, were trimmed off. Finally, all the above assessment procedure led to 12 final articles as a data in the study.

3.5 Characteristics of Included Study

The know-how of the characteristics of the study offers the lucidity on the subject matter under review, i.e., the approach to study design, conducted and reported and the potential it carries to address the research questions. The author, study purpose, year of publication, study location, mHealth intervention and its use, study methods and designs etc. are the considerations for characterizing the selected studies. Most of the authors researching mHealth in the selected studies like Lund et al.(2014), Fiander & Vanneste(2012), Oyeyemi and Wynn(2014), Ngabo et al., (2014) and Grameen Foundation's (2011) MOTECH (Mobile Technology for Community Health) also have several related publications on mHealth in Africa. The author's knowledge and expertise on the study area adds to the trustworthiness on the data. The representing Sub Saharan African countries in the selected studies are Ghana, Democratic Republic of Congo, Tanzania and Kenya, Rwanda, and Nigeria so far. The selected studies conducted in Sub-Saharan Africa are published between 2010-2017. Since it's little over a decade of mobile health emergence, it's only a couple of years the studies related to mobile health are showing up on the internet. Majority of them being clinical studies, it's still not easy to locate the proper mHealth studies done from social perspective. The selected study therefore covers some features of social aspects of mHealth in Sub-Saharan Africa. Nevertheless, the social aspects to mHealth have to be mined as the ideas were scattered here and there in the studies. The qualitative studies in the selected studies ranged from the pilot study, randomized controlled trial (RCT), interventional study to case-control study. The most frequent mHealth concerns in all these studies are related to skilled delivery along with other reproductive health issues such as family planning. The boxes below presents the information on the characteristics of the study:

Box 2 Characteristics of the Selected Study for Review

1. Publication (Articles)	-Corker, J (2010) “Ligne Verte” Toll-Free Hotline: Using Cell Phones to Increase Access to Family Planning Information in the Democratic Republic of Congo
Study Purpose	To determine hotline intervention’s reach and participation among men and women receiving confidential and accurate FP information
Country & Location	Urban areas in Congo , in 8 of the 11 DRC provinces
Intervention	Toll Free Hotline
Use of intervention	Partners use toll-free hotline for confidential family planning information and recommendation to family planning clinics.
Key Findings	New means of engaging men and potentially increasing partner communication, but reflected and reinforced existing power differentials and mobile divide.

2. Publication (Article)	-(Engle & Vadhat, 2010) SMS-based family planning in Kenya and Tanzania: FHI 360’s m4RH
Study Purpose	To evaluate mHealth interventions feasibility, reach and effect on contraception use
Country & Location	Tanzania and Kenya

Intervention	SMS
Use of intervention	Users opted-into an interactive and menu-based SMS portal that provides automated information about family planning methods
Key Findings	Created new channel for male engagement and potential increased couple's communication on family planning.

3. Publication (Report)	-Fiander et.al (2012) Transport My Patient (Report)
Study Purpose	To address transport costs, which are a major barrier to patients accessing Fistula treatment.
Country & Location	Tanzania DRC's 11 provinces
Intervention	SMS
Use of intervention	The initiative uses mobile phone technology to transfer funds to cover transport costs
Key Findings	Approximately 1000 fistulas are repaired annually in Tanzania enabling women to reintegrate back into the family and society

4. Publication (Article)	-Oyeyemi and Wynn (2014) Giving cell phones to pregnant women and improving services may increase primary health facility utilization: a case control study of a Nigerian project -
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Study Purpose	To compare the facility utilization rate of the pregnant women participating in the Abiye project in trial and control group in two neighboring regions ; Compare the frequency of occurrence of the 5 major causes of maternal deaths in the project area and the control area; to identify the benefits and challenges of the Abiye cell phones to the users
Country & Location	Nigeria Ifedore (the project area) and Idanre (control area) , the hilly region of South-western Nigeria
Intervention	Call and SMS
Use of intervention	Pregnant women use both the text messages and calls to get health services during the pregnancy and pregnancy related emergencies
Key Findings	The total facility utilization rate of pregnant women was significantly higher in project area than in control area; Causes of maternal death in both intervention and control area are same

5.Publication (Article)	-Ngabo et al., 2012 Designing and Implementing an Innovative SMS-based alert system (RapidSMS-MCH) to monitor pregnancy and reduce maternal and child deaths in Rwanda
Study Purpose	To monitoring pregnancy and reducing bottlenecks in communication associated with maternal and newborn deaths
Country & Location	Rwanda Musanze, Rwanda’s most mountainous district located approximately 85 Km (53 miles)
Intervention	SMS

Use of intervention	SMS being used by both pregnant women and community health workers to improve access to antenatal, postnatal care, institutional delivery, and emergency obstetric care
Key Findings	Increase in facility based deliveries after the intervention; Reduction in delay as a result of SMS alert system to health facility for timely intervention

6. Publication (Article)	-Lund et al., 2012 Mobile phones as a health communication tool to improve skilled attendance at delivery in Zanzibar: a cluster randomized controlled trial
Study Purpose	To examine the association between a mobile phone intervention and skilled delivery attendance in a resource-limited setting
Country & Location	Tanzania Primary Health Care Facilities in Island of Unguza, Zanzibar
Intervention	SMS and Mobile Phone Voucher Component
Use of intervention	Women use the mobile phones to bridge the communication gap between pregnant women and health providers
Key Findings	Increased skilled delivery attendance in a setting with scarce resources.

7. Publication (Report)	-Grameen Foundation (2011) Mobile Technology for Community Health in Ghana (Report)
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Study Purpose	To provide comprehensive overview of the Mobile Technology for Community Health (MOTech) project in Ghana and how it works
Country & Location	Ghana, 6 Rural Districts of Ghana (No specific location)
Intervention	SMS, Voice Messages and Calls for Mobile Midwife and the Nurses Application
Use of intervention	A woman can register for Mobile Midwife by speaking with a Community Health Worker who enters relevant information on a MOTech registration form on the phone or by calling and speaking with the MOTech call center. This service enables pregnant women and their families to receive SMS or voice messages that provide time-specific information about their pregnancy each week in their own language. At the same time, nurses also have the access to patients data
Key Findings	Many child health related questions than maternal health; Women aged 18-30 were contacting for pregnancy related queries via call; Calls were more popular than the sms; users prefer local language to receive information; many operation related challenges like local language, network coverage etc

8. Publication (Article)	Rokicki et al. (2017) Impact of a text messaging program on adolescent reproductive health: a cluster-randomized trial in Ghana
Study Purpose	To evaluate whether text-messaging programs can improve reproductive health among adolescent girls in low- and middle-income countries

Country & Location	Ghana, Accra
Intervention	Text Message
Use of intervention	The interactive intervention engaged adolescents in text-messaging reproductive health quizzes
Key Findings	Text-messaging programs can be useful tools to improve reproductive health knowledge among adolescents thereby reducing the unwanted pregnancy risk for sexually active adolescent girls.

9. Publication (Article)	Crawford et al. (2014) SMS versus voice messaging to deliver MNCH communication in rural Malawi: assessment of delivery success and user experience
Study Purpose	To determine the difference in delivery success of health messages delivered through pushed SMS, pushed voice messages sent to personal phones, and voice messages retrieved from a community phone (“retrieved voice messaging”), as well as the difference in quality of the user experience
Country & Location	Malawi, Rural Malawi
Intervention	SMS and voice
Use of intervention	SMS versus voice messaging to deliver MNCH (Maternal Newborn Child Health) communication
Key Findings	SMS and voices messages, can be successfully used to extend health information services to pregnant women. All 3 message modalities led to high levels of satisfaction, comprehension, and new

	information learned. Due to lower cost, higher delivery success, and higher levels of intent to change behavior, SMS is the preferred delivery modality when possible.
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10. Publication (Article)	Omole et al. (2016) The effect of mobile phone short message service on maternal health in south- west Nigeria
Study Purpose	To determine the impact of SMS (text messages) on maternal health behavior in Ife- Ijesa zone of Osun State, Nigeria
Country & Location	Nigeria, Osun State
Intervention	SMS
Use of intervention	SMS featuring ANC scheduled reminders and pregnancy- related health messages delivery to pregnant women
Key Findings	SMS had a positive effect on the rate of facility delivery by pregnant women. The study provide a basis to inform health policy recommendations on the integration of locally appropriate and culturally acceptable SMS messages to improve maternal health-seeking behavior

11. Publication (Article)	Lund et al. (2014) Mobile phones improve antenatal care attendance in Zanzibar: a cluster randomized controlled trial
Study Purpose	To evaluate the effect of a mobile phone intervention on antenatal care and skilled delivery attendance

Country & Location	Tanzania, Zanzibar
Intervention	SMS and Voucher Component
Use of intervention	SMS featuring ANC scheduled reminders and pregnancy- related health messages delivery to pregnant women
Key Findings	The wired mothers' mobile phone intervention significantly increased the proportion of women receiving the recommended four antenatal care visits during pregnancy and there was a trend towards improved quality of care with more women receiving preventive health services, more women attending antenatal care late in pregnancy and more women with antepartum complications identified and referred

12. Publication (Article)	Fedha,T (2014) Impact of Mobile Telephone on Maternal Health Service Care
Study Purpose	To assess the impact of mobile technology on maternal health care services utilization and neonatal outcome
Country & Location	Kenya, Nakuru County
Intervention	Only mobile phone mentioned
Use of intervention	Use of mobile phones to attend antenatal services
Key Findings	Positive relationship with mobile telephone use and number of total antenatal visits, antenatal service uptake and hospital delivery

3.6 Data Extraction

Data Extraction is a process whereby relevant data are taken from the selected papers and stored in one single data extraction form (Boland et al., 2014, p.87). The data material chosen for this study are primarily articles from journals. Besides, the grey literature such as organizational reports also forms the supporting data material. The qualitative data analysis software Nvivo 11 is used to electronically extract the data for the convenience to code and develop themes. The main reason behind using Nvivo 11 was its ability to trace instantly where in the article the extracted codes are situated. So, it's always possible to get back to the codes and edit it easily. However, for the convenience of a reader, the separate data extraction table using excel spreadsheet is also used to give the glimpse of used data. I repeatedly reviewed the research questions during the entire data extraction process. Before using the Nvivo 11 and excel spreadsheet, I already piloted the Cochrane data extraction form using four articles. The Cochrane data extraction form by Wiley online library was pretty detailed and consumed plenty of time to extract the data as it required to copy and paste the data chunks. Cochrane data extraction piloting directed me to time efficient process of accumulating data using Nvivo 11 and excel spreadsheet. Before proceeding with the thematic synthesis or analysis, I prepared the summary of the themes containing the descriptive codes from Nvivo 11. In the annex section below(see page p.67), I have attached the screenshot to provide the glimpse of how I coded using Nvivo 11.

3.7 Methodology

3.7.1 Qualitative Data Synthesis and Feministic Approach

The systematic qualitative review aims to broaden the reader's understanding of the particular phenomena through the consideration of themes within, or across qualitative data (Boland et al., 2014, p.151). Boland (2014) states that the quantitative evidence synthesis determines whether or not something works whereas qualitative evidence synthesis allows exploration of such issues in more depth, for instance, considering what works for whom and why. Qualitative evidence synthesis offers rich data relating to the impact of the condition, intervention, or policy on the lived experiences and feelings of those involved. Besides providing the freedom on how best to analyze data, reviews of qualitative evidence may offer

richer conclusions than reviews of quantitative data due to the higher depth of analysis (Boland et al., 2014, p.144).

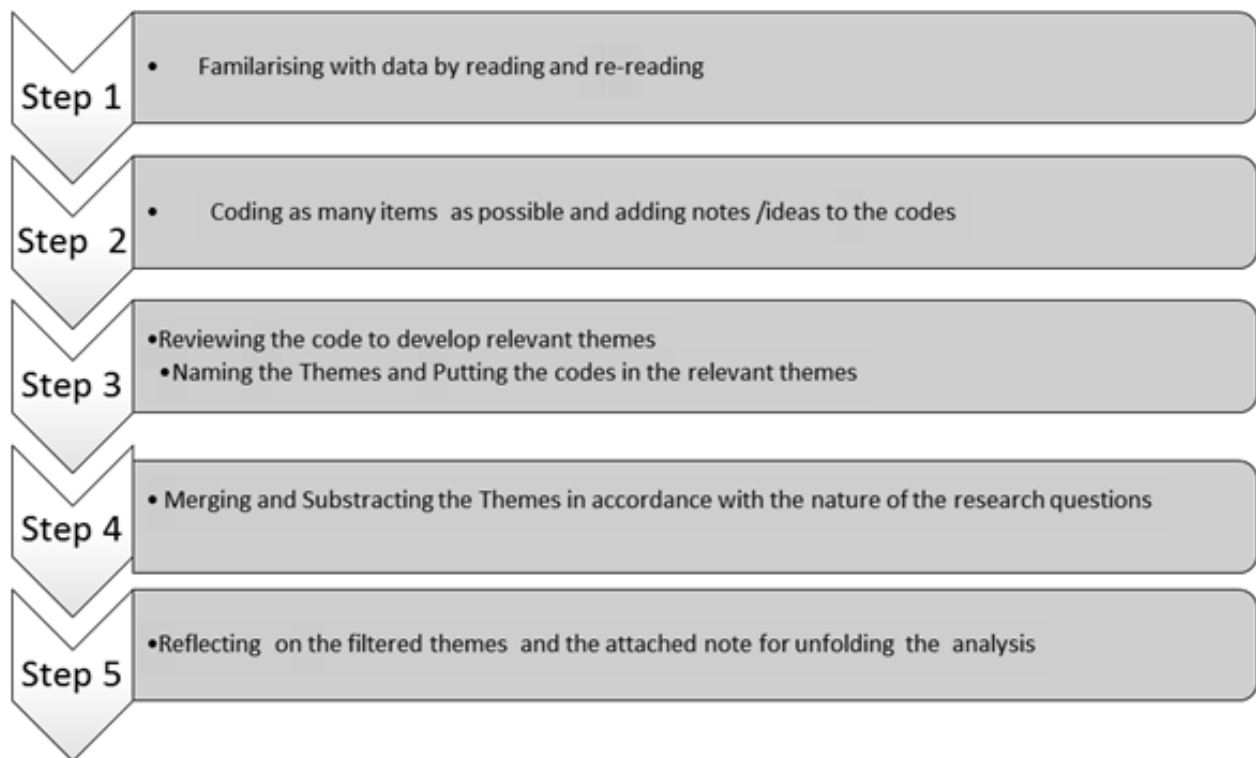
Boland (2014) argues that the synthesis of qualitative data demands a philosophical backdrop. The feminist research methodology is the backdrop or standpoint for this study. “Feminist method are tools that in feminist hands often aim to listen to muted language” according to Hesse-Bibers’ (2004, p.216) feminist perspective of social research. Following Harding, feminist explicitly link theory with methods and scholars create the methodology feminist by arguing against the mainstream ways research has proceeded and how the approach has been applied to research questions and data (Harding, 1987,p.3). Harding argues that feminist researchers may use a wider variety of methods in a single project or use a way that may be considered unique to feminist research (Harding, 1987 in Hesse-Biber, 2004). Hesse Biber asks the complex questions such as what makes feminist research feminist and are there any particular applications of a method that is distinctly feminist. Hesse-Biber asserts that feminist researchers are not wedded to any one specific method but rather their approach digs into invisible and essential concerns in women's lives that contribute to knowledge building. Hesse-Biber further explains that epistemology, methodology, and methods are not isolated from each other but rather connects in an interdisciplinary manner to produce new knowledge (Hesse-Biber, 2004, pp. 209-210). Hesse Biber further mentions that this connection might occur through the reflexive sensitivity the feminist researcher employs while engaging in data collection. Hesse-Biber adds feminist researcher is curious to know the meaning, construction of new spaces and dilemmas brought about by the experience of reflexivity (Hesse-Biber, 2004, p. 219). For Reinharz, the whereabouts of feminist researchers are the theoretical and epistemological perspectives as a feminist (Reinharz, 1992, p.244). Reinharz appreciated the feminist researcher's effort to avoid a narrowing of a method and methodological choices available to researchers. She suggests the use of multiple methods to link related event in the past and present with actions and experiences to broader social frameworks (Reinharz, 1992, p.197). Motivated by the feministic approach to research, I have borrowed the multiple methods for this study such as using Nvivo 11 for data extraction, cochrane standard data collection form, method of screening the data from systematic reviews etc.

3.7.1 Thematic synthesis to analyze the qualitative evidence of findings

Thematic Analysis applies for health promotion intervention as to what works. "A theme captures something important about the data about the research question and represents some level of patterned response or meaning within the data set." (Braun and Clarke, 2006, p.82). It synthesizes findings from multiple qualitative studies and systematic reviews. Thematic Synthesis involves identifying critical concepts from studies and translating them into one another. The term 'translating' in this context refers to the process of taking ideas from one study and recognizing the same concepts in another study, though they may not be expressed using identical words (Thomas and Harden, 2008).

A thematic approach focuses on the "what's" of the stories (rather than the structure), and seeks to identify common elements to theorize across cases (Riessman, 2007). The thematic analysis involves reading the transcripts several times, coding, developing themes and subthemes and seeking to identify core narrative elements associated with each theme (Braun & Clarke, 2006). While searching for themes representing research questions, I embraced the recommendations by Ryan and Bernard(2003). They recommended to check the ideas that repeats again and again, indigenous typologies that has local expression, transitions in which topic shifts in transcripts, similarities and differences between different transcripts, missing data and theory related material (Ryan & Bernard, 2003 in Bryman, 2012, p.580). Besides using Nvivo 11 software, I found myself comfortable in using pen and paper to jot down and relate the themes across one another.

The figure below presents the steps followed for Thematic Analysis in this study



3.7.2 Coding and Developing Themes

Coding is the starting point for most forms of qualitative data analysis, although some writers prefer to call the process indexing rather than coding (Bryman, 2012, p.575). It is a method of giving names to the ideas or chunk of text which provides the understanding of what's going on in an event or details provided in the text. According to Bryman (2012,p.597), "Coding in Nvivo's system is the process of marking sentences of the text in a project document with nodes(or themes)". Bryman further cites Lofland and Lofland (1995) about the consideration in development of coding as of what category the item of data belongs to, representation of data relating to research questions and answer, happenings and people's action, people's opinion, event etc. (Lofland & Lofland, 1995). Lofland et al. further suggest that codes can be act, activities, meaning, participations, relationship, and settings (John, Snow, Anderson, & Lofland, 2006). Likewise, Strauss suggests that the codes can be an interaction, conditions, strategies and tactics, and consequences of what happens if... (Strauss, 1987). Correspondingly, Sabatier (1986) suggests the possibilities of coding as causal adequacy, financial resources, legal/ bureaucratic power or constraints, political/interest group support, social or economic environment (Sabatier, 1986). Mason (2002) suggests that the codes can show up in several forms like literal(words, dialogue used, actions, settings, systems), interpretation (implicit norms, values, rules, mores, how people make sense of phenomena)

and reflexive(researchers role in the process, how intervention generated the data) (Mason, 2002). The phrases relating the equivalent phenomena are coded. The codes that are common in nature are combined together under a categorized Theme. A theme is the representative of the frequent occurrence of similar codes in relation to research questions i.e. a group of codes giving similar meaning were combined to form a theme. The themes and sub-themes are essentially recurring motifs in the text that are then applied to the data (Bryman, 2012, p.579).

The word frequency count is done in Nvivo 11 first to find the concentrated areas of the articles to get the general picture of data. Word Search or Text Search can help identify suitable keywords to get the handle on the concepts or categories you are looking for (Bazeley & Jackson, 2013, p.117). I have attached the word search extractions in the annex section. After getting the general picture of the data through the word frequency search, I followed the coding procedure. The steps for coding as suggested by Alan Bryman (Bryman, 2014, pp.576-577) was helpful to generate code for making themes. The steps are as follows:

Box 3 Bryman’s Steps in Coding

Bryman’s Steps in Coding
Code as soon as possible
Read through the initial set of transcripts/Documents
Make the notes about significant remarks/observation
Review the codes to check connection between the codes
Consider more general theoretical ideas in relation to codes and data

Do not worry about too many codes

Interpret the findings based on coding

The items in the data articles are coded thematically using Nvivo 11. In the past, coding was done by cutting and pasting using scissors and paste making a files of chunks of data, with each file representing a code (Bryman, 2014, p. 577). Depending on the concern an item represents, the themes were created alongside the coding. The items relating to the specific themes were coded. Likewise, many new themes emerged along as some of the items didn't match any of the themes. At the initial phase of coding, the codes were exceeding alarmingly as I coded line by line. At the later stages, the codes representing the similar idea were merged and the duplicates were removed as well. The analytical approach i.e. Grounded Theory was in the back of the mind rather than just going through the description in the data.

4. Literature Findings

After reviewing the literature from 12 studies, I came to summarize my findings that mHealth interventions, predominantly through pilot programs, are moderately successful in offering reproductive health care information upon need and facilitating women to contact health centers. The reason why mHealth is only reasonably successful is explained in the challenges section below. Moreover, the mHealth programs through skilled delivery have helped pregnant women to decide for a healthy birth and take care of themselves during the pregnancy period. However, the pragmatic pieces of evidence showing the direct gender impact of mHealth programs to empower women in decision making are limited. The various limitations range from social, economical to infrastructural and not all these restrictions are detailed. There is only insignificant mention of the application of mHealth in remote areas which narrows the study regarding challenges persisting between remote areas and mHealth. Presented below are the findings from the selected 12 studies.

4.1 Improved Antenatal Care (ANC) visits and skilled delivery attendance

Improving the skilled delivery also means reducing the causes that lead to maternal mortalities. These findings below address the research question no.1 that is the primary reproductive health outcome mHealth interventions has addressed through the use of mobile phone in SSA.

Nine out of twelve studies viz. Lund et al. (2014), Lund et al. (2012), Fiander et.al (2012), Omole et al. (2016) Oyeyemi and Wynn (2014), Fedha, T. (2014), Crawford et al. (2012), Engle & Vadhat(2014) and Grameen foundation (2011), in the study confirm that mHealth use has increased the numbers of women using antenatal care services and hospital delivery. Fedha, T. (2014) finds the increase in ANC and skill delivery especially among women owning their own mobile phone than the ones who were unable to attend either of those. The wired mother's program (Lund et al., 2012) stated that the number of women attending antenatal care in the intervention group increased by 16% than the control group (the group which resembles the intervention group but receives no treatment). Likewise, the calls for antenatal care (ANC) were made both during the emergencies and non-emergencies. Similarly, 59% of the women in the intervention group informed that receiving text messages increased their frequency of antenatal visits (Lund et al., 2014, p.6). Women below 19 years of age and illiterate women were the ones receiving not more than four or more antenatal care visits as compared to the ones who can read and write (Lund et al., 2014, p.6).

The wired mother's program (Lund et al., 2014) sent text messages to registered phone numbers throughout the pregnancy until six weeks after delivery. The messages provided simple health education and appointment reminders to encourage attendance at routine ANC, skilled birth attendance, and postnatal care (Lund et al., 2014, p.3). The attractive thing about the wired mother program is mobile voucher component. The mobile voucher consisted of modest credit to make a call to the local primary health care providers. If the women don't have any phone number to register, then she can use mobile voucher component to call to get the health information (Lund et al., 2014, p.3). It is, however, not clear as to if the women can use both the landline and cell phone to utilize the mobile voucher.

Skilled Delivery attendance has been recognized as a very crucial factor in reducing maternal mortality (Omole et al., 2014). In the mHealth study conducted in Western Nigeria, Omole et

al. (2014) found that 76% of women from the total participants considered SMS helpful for the issues of pregnancy and birth preparedness. Likewise, nine out of ten participants agreed that SMS influenced their decision to attend Antenatal Care (ANC) thereby motivating them to deliver in the health facility. Furthermore, 96.6% of the women considered SMS as a platform for informing ANC clients about obstetric danger signs. Lund et al. (2012) stated how Zanzibar represents many of the Sub-Saharan countries, with almost half of all the deliveries taking place at home or with no skilled guidance. Women delivering in health care facilities typically spent less than a day in the health facility, and preventable causes dominate maternal mortality in Zanzibar (Lund et al., 2012, p.1257). Lund et al. (2012) further mentioned that mobile phones had reduced the time that elapses between a health crisis and care to seek appropriate obstetric help. Oyeyemi and Wynn (2014, p. 2) mention Chukudebelu and Ozumba (1998) who revealed that "delays or unbooked obstetric emergencies accounted for about 70% of the maternal deaths. Oyeyemi and Wynn (2014, p.3) found that the application of mHealth has benefitted women from delay preventing these obstetric complications such as obstructed labor, unsafe delivery, etc. Oyeyemi and Wynn (2014, p.5) discussed the comments from the respondents where 98% of women believed that the number of maternal deaths either during the pregnancy or shortly after pregnancy had reduced drastically. The women got this information from the pregnancy-related news they heard and saw in their community. So this means that simply being unable to register for skilled attendance can have a detrimental impact on maternal mortality.

In a questionnaire survey done by Oyeyemi and Wynn (2014) among pregnant women to assess the use of service, 81% rated the service beneficial. Out of 81% women, Oyeyemi and Wynn found that 59% of mHealth users valued free communication with the health care workers, while 32% praised the ability of the mHealth program to respond promptly to emergency obstetric complications. And 15 % gave the general comment that mHealth has helped improve the way they use the health facility (Oyeyemi and Wynn, 2014, p.5). Oyeyemi and Wynn (2014) concluded that giving pregnant women access to free cell phones increased the use of the primary healthcare system leading to a reduction in the rates of different causes of maternal death. In this light, mHealth acceleration to register pregnant mothers for skilled attendance has proven remarkable in all the studies (Engle & Vadhat, 2014, Fiander & Vanneste, 2012, Oyeyemi and Wynn, 2014, Ngabo et al.2012, Lund et al.2014 and Grameen Foundation 2011). However, it is apparently clear that the impact of mHealth on Sub-Saharan African women has remained context-specific in the majority of

mHealth programs. The only problem for researchers to permeate through these contexts is the poor visibility of these contexts in mHealth documentations. Lund et al. (2012) baseline survey showed the influence of socio-economic variables on skilled delivery attendance; it reveals that only 35% of women with no education delivered with skilled delivery attendance, compared with 67% of women who completed secondary school. Likewise, Fedha, T. (2014, p.369) mentioned women's education relates to increased antenatal coverage, i.e., the education status positively co-relates with the ANC than those with poor or no literacy.

The percentage of skilled deliveries in Health Facilities in Rwanda was estimated at 48.84% in 2009 ranking among the lowest in the country (Ngabo et al., 2012, p.4). The main reason was a lack of sufficient workforce even for the essential reproductive health care service. In this context, Ngabo et al. (2012) discussed how the RapidSMS-MCH system through SMS helped the community in the rural mountainous area in Rwanda through the collaboration with community health worker (CHW). CHW assisted the women in the community to register and observe pregnancies until delivery and post-partum. Community Health Workers (CHW) sensitized community members about needs to attend antenatal care, and provide support and referral to the health center for prenatal care, particularly in the case of a life-threatening situation. RapidSMS-MCH sent an automated reminder for specific follow-up reminder for normal pregnancies, including delivery. In the case of urgent situations, the emergency alert system instantly informed CHW for an immediate action whereby CHWs manages ambulances for ensuring timely transfer to emergency obstetric and neonatal care (Ngabo et al., 2012). This enabled the accountability of CHWs for registered pregnant women to receive the scheduled health checkups. Since ANC and Skilled Delivery Attendance is closely associated with overall mothers' health, the above findings conclude that mHealth reminder system enhances the probability of improved health of mother and child both during and after pregnancy thereby minimizing the avoidable reproductive health complications.

4.2 Improved Reproductive Health knowledge

The findings in this section address the research question no.1 that is how can the outcome of an improved antenatal care, skilled delivery, and family planning be understood from a gender perspective and how has the reproductive health knowledge empowered women for their self-care. Mobile message imparted the information on reproductive health care such as maternal nutrition, HIV testing, family planning, postnatal care, baby care, breastfeeding,

immunization and other, commonly occurring pregnancy issues to the mothers in the intervention group (Omole et al., 2014, p.5). Lund et al. (2014) evaluated the effect of a mobile phone intervention on maternal health care. The study found that 71% participants expressed that the mobile messages played the preventive function to make the pregnant women aware of the danger signs occurring during the pregnancy (Lund et al. 2014, p.6). Text-messaging programs, amongst all, were effective tools to improve reproductive health knowledge among adolescents (Rokicki et al. 2017, p.15). L'Engle et al. (2014) and Corker, J. (2010) reports that more men inquired the contraceptive methods for both themselves and their female partners, suggesting better communication among couples in reproductive health matters. This encouraged couples to discuss health issues that were traditionally addressed in women-only clinical settings. Correspondingly, (Engle & Vadhat, 2010) revealed that a free and confidential interactive SMS portal service in Tanzania offered men with the chance to skip the long waits and fees at the health facility. As a result of which half of the queries sprouted from men. The information portal consisted of family planning technique effectiveness, side effects, and duration of use. In a study conducted on the impact of the text message on Adolescent Reproductive Health in Ghana (Rokicki et al., 2017), the mHealth participants used free public hotline number for reproductive health information. Besides getting the tips about the effectiveness of condoms, men and women received additional knowledge about the benefits of discussing reproductive health issues among one another (Rokicki et al., 2017, p.6). The authors in the selected studies (Engle & Vadhat, 2010) , Fiander & Vanneste (2012), Oyeyemi and Wynn (2014), Ngabo et al. (2012), Lund et al. (2014) and Grameen Foundation (2011) stressed mHealth as a potential approach to reach underserved population for better reproductive healthcare information. In this regard, mHealth projects selected for this study like MOTECH Ghana, Wired Mothers, Abiye Project, Ligne Verte, RAPIDSMS-MCH, Chipatala Cha Pa Foni (CCPF) besides offering the reproductive health care information service has been found empowering the community members by connecting people and information in more innovative ways. The mHealth promotional strategies of Grameen Foundation in Ghana, through infomercials during market days had a considerable effect on awareness on the use of mHealth services (Grameen Foundation, 2011). The call center aimed for just registration was transformed to customer support center where the people had their problems addressed by talking to a live person. MOTECH also received the feedback from users about the content that they would like to have heard which were helpful for future content creation (Grameen Foundation, 2011, p.33). Likewise, through calls, people wanted referrals to other good places too, not just the nearest

facility. This ensured that upon the availability of services and proper marketing of mHealth service, mHealth users are keen to know how they can better use the services for their benefit. The Chiptala Cha Pa Foni hotline offered the toll-free hotline offering protocol based health information like reminders for pregnant women based on the estimated date of delivery. Besides the reminders, the hotline also offered health advice and referrals as to when and where to seek the care in case of health emergencies (Crawford et al., 2014, p.37).

Unlike in other mHealth projects where the midwives or community health worker are only women, RAPIDSMS-MCH mHealth program in mountainous district of Northern Rwanda also engaged men community health workers (CHWs) as a middleman between the pregnant women and mHealth service provider (Ngabo et al., 2012, p.4). It is however not further discussed as to what kind of tasks does male CHW play as a mediator in RAPIDSMS-MCH program. The involvement of male CHW at least influences the trend where CHW are mostly women in an African patriarchal society. Grameen Foundation (2011, p 43) reported that as soon as mHealth pilot program began and people knew about the availability of free information in their local language then it wasn't just pregnant women but young men, older women, traditional birth attendants, midwives, fathers and young women showed up to sign up. This displays the power of localized, relevant and accessible information to attract the members of society for information and education dissemination. Some of the selected studies exposed the deteriorating cultural practices harming the women's health and attitude towards reproductive health matters. Grameen Foundation (2011 p.23) stated that myths and dietary practices were distressing in most of the northern Ghanaian regions which are affecting the way people view the signs and symptoms of pregnancy. Grameen Foundation (2011, p.6) states:

"Swollen feet during pregnancy means the baby is a boy. Long or complicated labor means the woman has been cheating on her husband. First milk after birth is dirty. Eating eggs or meat during pregnancy will make the child a thief (as they will get a taste for eggs and meat, both of which are expensive, and be forced to steal for eating expensive foods). Eating certain foods (proteins mostly) makes the child very big and difficult to deliver. Evil people can cast spells on your pregnancy, causing you to lose it (the evil eye). This kind of superstitious beliefs causes many women to hide their pregnancy for as long as they can, which interrupted even seeking for Ante-natal care."

Grameen Foundation (2011) through the focused group discussion promoted the use of mHealth during the pregnancy; all these myths were replaced with scientific medical explanations like long labor could be due to the cord being wrapped around baby's neck rather than being disloyal to partner, etc. The midwife's facilities were ensured to help pregnant women if any problems occur. To empower the concerned stakeholders regarding reproductive health issue during pregnancy, the involvement of members of the community such as husband, mothers, mother in Law, pregnant women, landlords, village chiefs, community health workers were remarkable. The focus group identified the effects, challenges and experiences of pregnancy and newborn on each member of the community participated in focused group discussion. The aim was to inform people about how decisions are made and by whom during such period. This community engagement helped to check the preparedness of the support networks that people have around them in times of emergencies.

4.3 Contextualized Mobile Functions (SMS and Calls) Use as a result of digital illiteracy

This section addresses the research question number 2 that is the gender implication of the use of either of these mHealth functions (SMS or Calls). Literacy in health is the capability to read, comprehend and process the health information and services to make the proper health decisions (Institute of Medicine, 2004; Ratzan and Parker, 2000). In this study, one can understand the inability to read and understand information via text messages on mobile phones as digital illiteracy. The educational message, the personalized message based on the patient's stages of pregnancy, care history, local myths and beliefs related to pregnancy and their several other preferences were sent to mHealth users (Crawford et al., 2014). Associating the two main prevalent functions of the mobile phone viz. SMS and Calls concerning SSA, this study attempted to seek the understanding of the context under which men and women make use of SMS and calls for getting reproductive health care info. The acceptance and utilization of mHealth, most importantly as Calls and SMS, as one of the forms of mobile media, has narrowed the gap between decision-making and seeking reproductive healthcare information for a majority of women in the selected studies. The messages that the pregnant woman received saved their time visiting the health facility just to obtain the care information which they could quickly get via phone. SMS and calls benefitted pregnant women to remind attendance (ANC and Skilled Delivery) at a health promotion center in almost all the selected studies (Lund et al. 2014, Lund et al. 2012, Fiander et al

2012, Omole et al. 2016, Oyeyemi and Wynn, 2014, Fedha, T., 2014, Engle & Vadhat, 2014, Grameen foundation 2011 and Crawford et al. 2014). The application of either SMS or call were contextual about socio-economic condition of users. Crawford et al. considered SMS appropriate than calls both due to the telecom cost and ability to deliver the message even when the battery is flat (Crawford et al., 2014, p.36). Likewise, SMS ensure more privacy and confidentiality as compared to calls (Engle and Vadhat, 2014). But when the mHealth users are no to less literate, voice messages were more functional than the SMS (Crawford et al., 2014). Out of the 12 studies selected for the study, only four studies viz. Corker, J (2011), Oyeyemi and Wynn (2014), Grameen Foundation (2011) and Crawford et al. (2014) included voice messages and call as the mode of mHealth intervention. Grameen Foundation's MOTECH conducted its facility in the rural areas, the reason behind users choosing the voice message is the persistence of high level of illiteracy among the women and literacy mainly relates to English (local languages are oratory in origin and rarely written). Likewise, the other possible reason behind choosing voice message could be that voice calls ensure more privacy than SMS (Grameen Foundation, 2011, p.5).

Similarly, reduced literacy is linked to a barrier to mHealth use in the selected studies for review. Crawford et al. (2014, p.2) stated that deprived women in rural areas are relatively illiterate than their urban counterparts. That is the reason Chipatala Cha Pa Foni designed three message delivery modalities viz. a. Pushed SMS message (for clients with access to personal or household phones), b. Pushed Voice Message (low literacy clients with access to personal or household phones) and c. Retrieved Voice Messages (client without access to personal phone call the toll-free hotline from any phone and enter their code to hear their message). Likewise, women who registered for pushed SMS were formal sector employees such as teacher, health care worker, business, etc. than those in informal sectors like a farmer, housewife, etc. that registered for pushed or retrieved voice messages (Crawford et al., 2014). This shows that even though the SMS can be convenient from the mHealth project perspective, the voice messages are the necessity in case of users' inability to read the messages. Crawford et al. (2014, pp.43-44) also found that SMS users were more likely to report the behavior change as compared to the users of voice message users. This result is due to short SMS being more comfortable to read multiple times and shared with others as compared to long voice messages which people heard once and forget. Correspondingly, Fiander & Vanneste (2012) also stated that some illiterate people living in rural villages that are not exposed to many forms of media triggered the need to hear the message more than once before deciding to access the services. This may not be encouraging concerning the

convenience of mHealth use. Thus, despite being mHealth service available, poor literacy has accounted for the reduced use of SMS service thereby disabling poor rural women to decide for themselves. Even though mHealth accelerated the pregnant women engagement, the impact on SMS effectiveness seems to have been to some extent affected by the educational factors such as digital literacy to read SMS, knowledge of local written language and other users related information. And voice messages, despite being an alternative to SMS, may not be practical for every illiterate user with regard to network, phone credit, ownership of phone, electricity to charge etc. Thus it can be concluded that using mobile phone for reproductive health care has its own pros and cons due to the technology demanding additional arrangements for mHealth effectiveness.

4.4 Basic Social, Infrastructural and Project Sustainability

Challenges Accountable to mHealth Effectiveness

The findings below address the research question no.4 that is the potential barriers to efficient mHealth outcome documented in the selected studies for this review. The results informed that even if the woman has access to mobile phones, the rate of skilled delivery in rural areas was relatively lower as compared to the woman in urban areas. The studies in which more women attended antenatal care (ANC) services were the studies conducted in urban areas. For instance: Corker, J. (2010), Lund et al. (2014), Lund et al. (2012), Fiander & Vanneste (2012), Omole et al. (2016), these studies are from urban parts. Whereas Oyeyemi and Wynn (2014), Fedha, T. (2014), Crawford et al. (2012) and Grameen foundation (2011) conducted their studies on rural areas. Lund et al. (2012) found a difference in the mHealth intervention effect between women of urban and rural residence i.e. 82% of urban women in the intervention group delivered with skilled attendance contrary to 43% of rural women. He mentioned the insignificant impact of mHealth intervention in rural women is due to the factors like transportation, the proximity of health center from the users, information availability, etc. Similarly, there is a regional difference in ANC attendance with 60% of urban women making more than four visits, unlike rural women where only 44% attended four visits or more (Fedha, 2014, p.372). Fedha linked this difference with women's literacy status and stated that women in urban areas have more access to education and are literate to read SMS reminders than people in the rural areas (Fedha, 2014).

Similarly, the figure of women choosing the voice message over SMS outnumbered in some of the studies. The studies (Lund et al., 2012, Oyeyemi and Wynn, 2014 and Grameen Foundation, 2011) showed that women prefer SMS in urban areas with considerable literacy in written local language whereas voice calls in the areas where they have no written knowledge of local language. Oyeyemi and Wynn (2014) state that only 23% of those who had access to cell-phones used their cell-phones for texting, he also supported the fact that low literacy rates in rural areas accountable for low SMS users in his findings. Lund et al. therefore suggest the special arrangement to the illiterate, such as using voice SMS and the use of women groups as the community contact person to reach the most vulnerable women who do not have access to mobile phones and do not attend antenatal care even once. (Lund et al., 2014, p.9).

The mHealth outcomes are affected mainly by the similar nature of challenges in almost all the mHealth projects in SSA context. All the selected studies (Engle & Vadhat, 2010; Fiander & Vanneste, 2012; Oyeyemi and Wynn,2014; Ngabo et al.2012; Lund et al.2012 and Grameen Foundation, 2011) agree on one common stance that mHealth as a pilot project to create the desired impact is full of challenges. For instance, out of the total population of pregnant women participating in Abiye project, 23.5 percent lack mobile phone at all (Oyeyemi and Wynn, 2014, p.5). In "Ligne Verte" project of Democratic Republic of Congo (DRC), Cell phones are found sharing between family members in resource-poor settings (Corker, J.,2010, p.27). Those reporting the missing messages or reminders were the participants who shared the phone with their family members than the one who owned the phone (Rokicki et al., 1027, p.8). Likewise, in Wired Mothers project, only 37% of women included in the study owned a mobile phone. Rest of the women had either shared phone or various other kinds of access (Lund et al., 2014, p.5). The Wired Mothers intervention, however, was highly significant amongst urban women (Lund et al., 2012, p.1258). The fact that mobile phones intervention benefitted women residing in relatively urban women in 'Wired Mothers' project can also imply the opposite, i.e., the rural women were less benefitted. Women's access to mobile phones provided the good ground to picture the interrelation between women's access to mobile phones and mHealth effectiveness. Likewise, the reported obstructions to the use of cellphones in Abiye mHealth project in rural Nigeria were particularly physical infrastructure related, i.e., 36% stated electricity to charge the phone as a challenge, whereas 27% mentioned network failure as the major issue. Besides,

49.1% walked to their local health facility, 33.6% used a motorbike, and 17.2% traveled by car or bus.

The formal m-health programs like pilot programs are limited in coverage and scope; the studies document the prospect of significant coverage still a challenge due to the infrastructure and governance issues. Grameen Foundation (2011) for instance mentioned that the nurses viewed MOTECH as a temporary project rather than a part of the regular health care program. Since the nurses expected additional payment for additional work that they got for conducting the MOTECH service in addition to their routine job as a nurse, the absence of extra payment demotivated them to carry out the extra service effectively which ultimately affect the quality of service delivery. This is a small issue facing mHealth the administrative aspect of mHealth, the focus here is however not the executive part. This shows that the mHealth interventions not only relate about health care receiver's behavior change but it also entails behavior change from the providers' side.

The findings from the review of 12 studies showed that the proper impact of mHealth not just dependent on the introduction and existence of mHealth interventions but also on the ability to address the social, economic and physical infrastructural challenges. For instance: MOTECH (Grameen Foundation, 2011, p.3) resolved the connection problem due to the spotty network coverage in the Upper East Region of Ghana and had achieved the better results. Considering the factors like cost, operation, functionality, usability and data quality, MOTECH opted for improved data transmission method, i.e., using GPRS (General Packet Radio Service) message over SMS. Java-enabled handsets were found more suited to poor network areas than SMS because data about clients can easily be saved on the phone and uploaded when connectivity is restored. MOTECH found using the GPRS over SMS as an extremely useful feature under the poor network circumstances in rural areas (Grameen Foundation, 2011, p.16). Using GPRS, however, may require a thorough study of the feasibility in poor resource settings.

Lund et al. (2012, p.1263) besides mentioning about limited access to mobile phones, discusses how mHealth interventions challenged rural populations with problems like electricity to charge mobile phones and higher levels of illiteracy, resulting in difficulties in reading text messages. In such cases where participants cannot read, MOTECH offered the choice for the participants to receive messages via voice where 99% chose voice over SMS (Grameen Foundation, 2011, p. 3). This shows that although the people have access to mobile

phones, "language "primarily the local or indigenous one that is hard to translate, could be the barrier to the exposure of vital mHealth information. Lund et al. (2012, p.1256) found that most of the maternal deaths are due to a result of avoidable causes. Those avoidable causes are primarily accountable to delay in seeking and receiving care in poor resource areas. Amongst many tactics to address these kinds of delays, the voucher credit system was also introduced as one of the solutions by few mHealth interventions. Lund et al. (2012) referred to a mobile phone voucher system which addressed the delay to seek care by enabling the mutual communication between the health care providers and pregnant mothers, also called 'Wired Mothers' in the study. The vouchers for wired mothers were free of cost which reduced the slight economic burden to afford the call or messages for women. The acceptance and use of these SMS vouchers have been depicted effectively to enable communication between health worker and pregnant mothers. But on the contrary, Omole et al., (2014, p.14) stated that the mobile credit being paid with the credit vouchers by the project might not be sustainable in the long term if the interventions were to be expanded on a larger scale. Lund et al. (2014, p.8) therefore suggested a toll-free number, which would redirect calls to local midwives. The challenges associated with seeking care via mHealth helped identify the vulnerabilities related to a favorable mHealth outcome to reproductive health care.

5. Discussion

The discussion below is guided by the findings of the research questions and analytical perspective as stated above (See page.)

5.1 mHealth, Gender Relation and Decision Making

The introduction and implementation of mobile health might make things approachable as compared to the conventional approach to seeking reproductive health care. But this does not necessarily assure the minimization of health and gender-related inequalities. Among an array of inequalities out there, I would like to discuss the gender inequalities regarding men's participation in reproductive health matters and decision making. The selected studies show that there are users who are registered as the mHealth user but do not necessarily use mHealth. Negligible mentions are found in mHealth literature as to why do women do not use or discontinue using mHealth services. The responsible factor for less acceptance and discontinuation are hardly visible in the mHealth literature. The registered but inactive

mHealth users can create the situation where the acceptance of mHealth interventions by users does not necessarily suggest that the users are using the mHealth services and the credibility of mHealth results based on users acceptance are susceptible regarding practical impact. I would like to link the relation of decision making with the acceptance and use of mobile phone as there is the decision making involved first as to use of mHealth services. Who decides for whom as to using these tech-based services demands the clarification concerning gender roles and power relations in SSA. As decision making in a patriarchal society in SSA are not independent, the female members of the family usually count on male members. Almost all the selected articles and reports for this review like Corker, J. (2010), Engle & Vadhat(2010), Fiander & Vanneste(2012), Oyeyemi and Wynn (2014), Ngabo et al.(2012), Lund et al. (2012), Grameen Foundation (2011), Rokicki et al.(2017), Crawford et al. (2014), Omole et al. (2016), Lund et al.(2014) and Fedha,T.(2014) show men's negligible involvement in mHealth programs. Understanding the reasons that the gender plays in accepting and using mHealth also helps to unlock the gender power relation regarding the ability to use ICT mediums.

Since there is a negligible mention of men's involvement in reproductive health matters, discussing the gender role behind the less acceptance of mHealth programs by men would be an eye-opener. Meager participation of men in most of the selected mHealth interventions studies is apparent. Considering the low involvement of men, the Grameen Foundation (2011, p.5) Midwife program prioritized the sharing of pregnant women experiences not only to spouses but also to other relevant members of the household. The purpose behind this is to make household members realize the importance of their participation. This kind of attempt to involve male would also strengthen the women's voice in the family. Since only two of the studies viz. (Corker, J.,2010; Grameen Foundation 2011) Report discuss the involvement of men in the reproductive health care, mHealth targeted users on a majority of the studies turned out primarily women. Likewise, those mHealth interventions give the impression that the mHealth programs women-centered rather than being gender integrated programs. Even though spouse's involvement is necessary and could make a meaningful impact on couples' reproductive health practices, the mHealth studies done so far offer an insignificant or partial detail of male involvement. There could be an indirect spouse support and involvement at the household level, but at the communal level, their direct involvement in the reproductive health care seems passive. This male passivity in a way signals the control of established male supremacy in which their involvement in female reproductive health matters may be

considered substandard. Berer and Hezner state that the programs that are demanding the involvement of men risks their social position of manhood before the domain of women, such as childcare, pregnancy and fertility control (Berer, 1996; Helzner, 1996). The lower male involvement in reproductive health matters in SSA displays women's internalization of the macho image of men who don't perform tasks identified as feminine. Holter considers this kind of dominion as an ideological oppression of women where men substantiate the false consciousness as a reality. Women let themselves defined with this false knowledge created by men and practiced by both men and women. Among others, low self-esteem women get by this kind of false consciousness allowed men define who and how the woman should be thereby guarding their masculine image. Moreover, the practice of false consciousness is molded right from the beginning of children's upbringing (Holter, 1976). The internalization of gendered mindsets is born out of long-practiced patriarchal ideologies and are not effortless to resist as it may take time and education for women to recognize false consciousness as "false consciousness". As a result of ideological patriarchal practices, women may attach different meanings to exposure to technology which could result in their marginalization from technological culture. By 'attaching different meanings', I refer to those ideas that result in ignorant behavior that may hinder women to accept technology. This ignorant behavior primarily exists in the poorer section of the society deprived of education, social and economic system. That's one of the many reasons as to why Marxian feminist theory concerns the improvement in the conditions of proletarian women (and men) (Sandra Harding, 1986 in Hesse-Biber and Yaiser, 2004, p.192). Holter adds, however, the women who can obtain resource on par with men are relatively well positioned, and they are not dominated by the men's definition of women and their false perception of reality (Holter, 1976).

One of the convincing reasons behind poor male involvement could be the widespread recognition of male as a breadwinner of the family where male members are often busy with income generating activities in SSA countries. If a male is a breadwinner, the chance that they undertake other household activities are low to negligible in patriarchal societies. This reminds me of the Marxist belief on the oppression of women where it states the division of labor being basis of oppression between men and women. If so then is it the women's reproductive functions and the timespan during her reproduction when she can't work making her weak? Marxist belief however resist the idea that the women's oppression merely lies in her physical powerlessness during pregnancy and childbirth. The only difference in men's and

women's situation during child bearing period is lack of women's resistance to a physical weakness for external labor other than caring for a newborn child.¹ Otherwise, men and women have equal ability to take part in child caring and rearing activities like feeding and nursing them.

Ironically, Ligne Verte (the mHealth project for family planning information) reports the high number of men calling in the hotline interventions. This indirect intervention in reproductive health matter indicates that either hotline interventions is preferred by men or the female members are not confident enough to inquire via hotlines. The frequently inquired issues in the Ligne Verte's mHealth intervention were related to the side-effects of contraceptives, the location of trustworthy clinics (originally the French word *confiance* is written, the translation of which is trustworthy), the meaning of birth spacing and the curiosities concerning contraceptives rumors (Corker, J., 2010, p.31). On the one hand, male members don't show up around the facility with their women, but on the other hand, men calling the hotline numbers in case of contraceptive issues rather than women is irony. Men called on behalf of their partners regarding the side effects experienced by the female partner, such as spotting or missed periods (Corker, 2010). One can conceptualize this in two ways, either man is very concerned about women's reproductive health, or women feel awkward to expose themselves by asking about their private bodily issues. Whatever the possible reasons be, women are lagging behind from the exposure and confidence they could have gained through inquiries with the mHealth personnel. This kind of exposure to technology, in fact, manifests the gender power relation in decision making to choose the kind of mobile functions (i.e., SMS or Calls) based on sexuality. Are men fearing the exposure and knowledge that women get from using these mobile functions, or it's yet another way of suppressing women's independence and freedom concerning decision making. In this regard, Holter asserts that unlike the form of oppression that is instituted and visible in the history so far, the oppression in modern times is more veiled than ever before. According to her, this subtle oppression is hard to resist and fight back. Her standpoint is that the form of oppression has changed from direct to indirect; from personal to structural oppression and from physical to psychological suppression. She doesn't merely limit the term oppression as the oppression of women by men, but she elaborates oppression as the women simply being the victim as to realize their interests, ability, and needs hindered by the social systems. This provoked me to give an example of "Mansplaining Hotline" campaign in Sweden. In Sweden,

¹ <https://www.marxists.org/history/erol/uk.hightide/basis.htm>

there are high men critics of the concept called 'Mansplaining'. Mansplaining is manipulating actions and domination techniques meant to put women in their place'. According to the Union's gender expert Peter Tai Christensen, "mansplaining could be done consciously or unconsciously, and it could be a technique to 'consolidate or restore' male privilege in a time when traditional gender roles are being renegotiated.² He says that the concept mansplaining cannot be ignored due to the presence of structural problem embedded in the concept. The reason behind digging this concept here is that the concept can be applied to the relatively low numbers of women calling in hotline interventions. As the interventions like mHealth indirectly urge women to decide for themselves, which is also, in a kind, negotiation of gender roles in itself. And the high numbers of men calling means men probably don't want their women a kind of exposure and ability to be confident in deciding and doing for their own. It is indeed a new genre of patriarchy which is directly invisible but does exist. Well, this is however not quite new for the patriarchal African Societies where submissiveness and being docile could be a sign of respect for the husband and the family. Voices of Africa (2013) cites the case of a divorced African woman whose husband blamed her for being indoctrinated by western culture upon denying to cook after ten hours long work day. She was threatened for replacing her with another obedient woman from Zimbabwe.³ This instance shows that the men may subconsciously feel that women being free, deciding for oneself and not conforming to traditional patriarchal roles could be a threat to a patriarchal privilege they are possessing.

On the one hand, men unpretentiously felt free to inquire as opposed to women regarding family planning issues. But on the other hand, there are the contradictory findings in the same study by Corker, J. (2010) in which the highest percentage of calls from women was from Kinshasa district in Congo, where women also have the top socioeconomic indicators. So, it signifies that higher socioeconomic development of the community depends upon the higher level of freedom and empowerment to decide and express. Harding states that global feminists are concerned about the similarities, differences, and relationships between different groups of women (and men's) situations at different locations within global political economies (Sandra Harding in Hesse-Biber, 2004, p.192). In this study, how the similar kind of mobile health initiatives can bring different result concerning the differences in women's

²<http://www.independent.co.uk/news/world/europe/sweden-mansplaining-hotline-sexist-men-dominate-lines-blocked-for-women-colleagues-a7431201.html>

³ <http://voicesofafrica.co.za/culture-patriarchy-and-the-shona-womans-curtsey/>

education, the existence of harmful practices and patriarchal ideology signals how the same thing affects differently among empowered and less empowered women. In this regard, Harriet Holter's master suppression technique is brought into light to elaborate how an indirect kind of masculinity affects women of different class. She explains that the women's oppression doesn't happen in the same way in all categories and groups of the population as oppression surfaces differently in different classes of the society.

Unlike in SMS the sex of the person making an inquiry is identifiable via toll-free hotlines. Corker, J.(2010) mentions Population Services International (PSI) Research and Metrics Department (2009) findings from PSI Family Planning hotlines in Benin and Pakistan - that the results have shown that men also make up the majority of callers in these locations, accounting for more than 75% of calls respectively (Corker, 2010, p.32). Toll-free hotline intervention is an interesting area to reflect upon as to why more men are active in calling than in other equally important areas like attending health care centers with their wives, partners, etc. The answer probably lies in the gender hierarchy in the patriarchal structural system and decision-making. The domination of masculinity in women's lives not just resonate the command over resources but also control via their relative economic power over women. The reason behind more men than women inquiring for family planning could be an ownership and access to mobile phones as stated in findings above. The ownership of material possessions could also have control over women's sexuality and freedom which is also a form of an indirect oppression. In this light, Holter refers to the situation that is socially determined rather than by masculine and feminine nature (Holter, 1976, p.3). Holter's study concerns both personal oppression (between men and women) and the systematic oppression (structural oppression) that oppresses women. Holter's argument on who oppresses whom to clarify how social system stimulates men into taking lord position over women primarily links to patriarchal cultural dominance. Holter considers the mystifying use of technology creates an opportunity for oppression similar to that of veiling, expert dominance, and bureaucratization (Holter, 1976).By mystifying she means the use of technology that not everyone can use due to several restrictions. Holter asserts that in system determined oppression, it's usually the inability to access the resources by women and the dominance relationship as a result of men's interests preceding women's without the proper ruling relationship. On the one hand, it's fair to say that who calls to inquire shouldn't be getting much attention, but on the contrary, it contradicts the purpose of mHealth projects targeted

for women's health care information to make them autonomous concerning seeking care and services. And the independence is not ascertained unless male counterparts support them.

Besides the hesitation to inquire about the private body issues, their reluctance to call on hotline could be linked to the patriarchal faith and value system in which SSA women belong to. The adherence to this deep-rooted faith and value are not surfaced unless and until triggered by certain circumstances. In this study, let's say the opportunity for women to call hotline is a circumstance that triggered those value system to surface in the form of decision making to contact the toll free hotline.

A study done almost three decades ago highlights that "men not only acted as 'gatekeepers', restricting women and children's access to health services but also through abuse or neglect, men's actions had direct bearing on the health of their partners and their children" (Gallen et al., 1986) in Sternberg & Hubley (2004). In the selected mHealth intervention studies, except men's low and direct participation, men are not found to be the direct hindrance in any of the reviews. The apparent male absence in most of the selected studies gives the impression that men are not empowering women through the direct involvement in the mHealth project. In reproductive health matters, most people have a perception that women are the sole participants and beneficiaries, whereby the role of men gets little attention. The decision making in SSA is still under the power of a patriarchal jurisdiction partly due to the gender hierarchy. Given this picture, the need to involve men in mHealth interventions are crucial to joint spousal decisions for realizing reproductive care goals.

5.2 Gender Sensitization of community through mHealth programs

Oyeyemi and Wynn (2014, p.2) mention delays in seeking healthcare, in reaching a facility, and in receiving care at a facility, as important factors accounting for much of the maternal deaths in Sub-Saharan Africa. Among many factors accountable for delays, lack of community sensitization is also identified as one of the concealed challenges from the findings. These delays don't just pertain to seeking health care but also applies to accepting the mHealth programs at first. Since most of the SSA countries are dominated by a patriarchal system, the acceptance of mHealth programs only by a female member of the family may not be enough. The fact that less than one quarter (23 percent) of the pregnant women were using the cell phone for family planning information in the m4RH program

provides a hint about the level of participation one can expect (Oyeyemi and Wynn, 2014, p.3). Besides poor economic condition, the ownership of fewer mobile phone by women than men could also be the result of poor digital literacy. In fact, it questions the literacy status of women in SSA. The fact that those women in SSA who cannot read and write the text messages reveal not just about their education status but also their overall status as women in the society. Their illiteracy also takes us back to the well-known globalization account of education field in SSA. Assié and N'Dri (2005) states that as a result of decreasing and eradicating educational subsidies, the increase in the cost to pursue education and lack of education policy readjustment is accountable for SSA girl's poor literacy. This was mainly the result of structural adjustment program (SAP) under globalization in SSA countries (Assié and N'Dri, 2005, p. 51). It is exemplified by the instance that in one of the all-girls school in northern Nigeria, nearly half of the students were dismissed from school because of an inability to pay for their education (Gender in Nigeria, 2012, p. 32). One can conceptualize this as discrimination one of the many forms of state oppression which provoked me to the idea of false consciousness by Harriet Holter. Holter says that besides the existence of false consciousness in family and society, its presence at decision-making level is baffling. Holter refers the confirmation of this kind of false consciousness at government level as Co-optation. Women assigned the prominent positions have more or less acculturated the male norms that those jobs entail and who in their occupation does not support women's demand. When male induced agenda doesn't address the women's issues, then the chances of women without the knowledge about their opportunity to promote their interests is rare. She says that the older forms of ideological oppression and co-aptation still exist today with the newer styles. Thus, the male acculturation and co-aptation are the forms of systematic oppression at the state level where the social arrangement structures itself in such a way that specific groups and person's interests dominate systematically and automatically while other's affairs are set aside (Holter, 1976).

Besides using mHealth as a tool to seek and offer information, making people and community informed to promote its use plays an equally significant role. MOTECH (Grameen Foundation, 2011) has been using promotional strategies to make men and women aware of the existing program to make the most use of it. Forty percent of respondents living in rural villages sent at least one message as a response to the marketing encouragement, relative to 7 percent in comparison villages. Likewise, m4RH (Engle & Vadhat, 2010, p.2) used clinics, pharmacies, and mass media to promote the text message service promotion.

Besides (Engle & Vadhat, 2010) found that the participants were also responsive to the SMS promoted by text message. Respondents showed interest in every message they received.

Likewise, MOTECH (Grameen Foundation, 2011, p.5) mentions that it's common in rural areas to hide their pregnancy due to superstitious beliefs about pregnancy and their symptoms. In this situation, pregnant women often fear the Evil Eye (their local myth) and avoid visiting midwife or health centers during their early stages of pregnancy. mHealth is ineffective in cases where women thoroughly cover their pregnancy, but once pregnant women are successful in registering, mHealth service follows up and address the pregnant women issues even if the clients miss to follow up. Therefore, it's not just the pregnant women who decide for herself, but it's also the mHealth systems that ensure her checkups. In SSA, more than half of the unmarried adolescents have an unmet need for modern contraception (Rokicki et al., 2017, p.3). Rokicki et al. (2017) discuss how the poor contraception availability is further accompanied by the unsafe practices as many Ghanaian adolescents' women practice washing after sexual intercourse as a technique to prevent pregnancy, misconception that performing sex while standing up also prevents one from conceiving etc. mHealth solutions lie at the heart of these malpractices born out of illiteracy and lack of awareness. mHealth innovations and approach could transform the people's attitude towards wrong beliefs thereby preventing wrongdoings as well.

MOTECH's "Mobile Midwife Service" alerts nurses about clients who are due or for care, to prevent missed appointments and delays in service provision (Grameen Foundation, 2011, p.2). Besides MOTECH and m4RH, very few mHealth interventions were found sensitizing the community on reproductive health matters. The information gained and the culture of sharing is significant for empowering communities even after the project period expires. This kind of information sharing could be bliss in the areas where there are the superstitious beliefs and practices regarding pregnancy. The majority of selected studies, however, targets women even though there is the possibility of male involvement. The participation of male can transform the way people view the reproductive health care programs. In the mHealth interventions like family planning, there is no clarity about for whom the program intended to address. Even though the mHealth interventions intends to offer the information services for both the sexes, lack of purpose transparency among recipient risks the mHealth programs being stereotyped. As a result of which men may not pay much attention to such programs.

This informs that the kind of gender norms the mHealth programs are projecting in a particular setting carries much significance from the gender perspective. In this kind of situation, the gender sensitization to free any health programs remain stereotype free is very important.

Through Grameen Foundation's (2011) focused group discussion(FGD), people also got to realize about the roles and priority shifts which happen as a result of the pregnancy such as traditions/beliefs surrounding pregnancy and childbirth, as well as knowledge gaps. Besides the use of mHealth, this kind of information enabled participants to be aware of the need and support that pregnant women require. The household of pregnant women was advised regarding the experiences of pregnant women to strengthen her voice in the family. This shows that mHealth was not entirely limited to use of mobile phones and its tools but it also addressed the urgent socio-cultural issues surrounding the women, her family, and the community respectively. Fertility outcomes or child-bearing are the decisions taken on equal footing and responsibility of both the men and women. The gender equality on negotiated gender roles not just comforts the childbearing task but also promotes to share several other childbearing duties. mHealth interventions to some extent have sensitized the community on the importance of men's participation in reproductive care and that each household member is responsible for decision making and power sharing during the pregnancy period.

6. Conclusion

The purpose of this review was to have an insight into the mobile phone aided (especially through SMS and Calls) reproductive health care in SSA from gender aspect. Amongst others, this review found that the antenatal care and skilled delivery were markedly addressed by mobile phone through SMS and Calls. Likewise, the context under which women are able and even unable to use mHealth to seek reproductive health care and the involvement of men as a spouse in reproductive health matters emerged as a good standpoint to discuss this study from the gender perspective. Harriet Holter's Master Suppression Technique has been helpful to support what's been observed as an invisible form of oppression pertaining to mHealth use by women. Even though these invisible form of oppression doesn't prevail intensively these days due to gradual awareness in the mindset of people, negligence to defy any minor form of oppression can affect women in the perpetuation of masculine culture. Even if the new forms of masculine norms and performance hinder the development of one women, it's still a problem that needs an address.

The perspective upon which mHealth can be studied could be wide-ranging, but this study focused more on the user perspective of mHealth i.e. women as a user of mHealth. Since mobile health technologies are specifically designed for the ease of people, this study to some extent is successful to see whether or not mHealth is successful to make an impact on its users. The impact was found conditional i.e. influenced by the socioeconomic conditions. Gaining information on why women prefer one mobile function over another brought light into the conditions of effectiveness of either of these mobile features (SMS and Calls). Challenges to using ordinary mobile health functions such as reading SMS showed that mHealth compatibility studies as to what works best are vital for an excellent mHealth outcome.

The exploration of evidence from the studies summarizes that mHealth interventions have moderately addressed the reproductive health information need in sectors like ANC, skilled delivery and family planning to some extent. All the studies selected for review put forth the promising prospect of mHealth for women independence in seeking the health care. Amongst all, using mHealth functions like text and calls has at least found reducing travel time for the patients seeking reproductive health information. Reducing travel time means a lot in African communities where most of their time are spent doing either household or income generating activities. The success of mHealth interventions demands the fulfillment of prerequisites, i.e., what facilities do people should already have for being able to use any health services conveniently. The study of mHealth interventions from the selected studies indicated that one size doesn't fit all, i.e., the mobile health access and the outcome is circumstantial and varies between urban and rural populations. Ownership of mobile phone doesn't necessarily guarantee the potential of mHealth use. As mHealth interventions are not just about mobile phones, many interconnected necessities connected with the mobile phone such as digital literacy, credit in a telephone, electricity for battery charge, proper network, support from family, etc. are some of the factors deciding success and failure of mHealth actions. Moreover, poor knowledge of written local language among women has been a significant setback of mHealth effectiveness in the majority of studies in SSA. Despite owning a mobile phone, the inability to read SMS has marginalized the majority of the illiterate population from gaining the mHealth benefits. In the studies like Grameen Foundation (2011) and Wired Mothers (2014), the text message wasn't just about reminders to care and health center visits but also included the educational text messages referring to nutrients which increase the

women's nutrition knowledge for both the pregnant women and women who recently delivered. In this scenario, those unable to read text messages are also deprived of essential care information too. However, this kind of digital literacy barriers to health care in SSA does not apply to young people (Hampshire et al., 2015, p. 91). The Wired Mother Program (Lund et al., 2012) apparently accepts the fact that their intervention was not quite accessible to the poorest and the most vulnerable to obstetric emergencies. Lund et al. (2014) also justified why only the presence of mobile phone and health care provider, as seen in many mHealth projects, is not sufficient for addressing the marginalized population in remote areas. Lund et al. discussed that the receptiveness of mHealth interventions depends upon the ability to defend multi-faceted obstacles to care such as poverty, illiteracy, quality of care, geographical barrier, socio-cultural factors, etc. The studies, therefore, point out the effectiveness of the mHealth programs circumstantial.

Besides visible challenges, the unseen yet the imminent threat for all the pilot projects has been its sustainability. Even though there is an increase in mobile phone subscription, dropping costs of a mobile phone in SSA, the prompt innovations in mHealth technology seem to have catalyzed the proliferation of mHealth pilot projects. Almost all the mHealth projects selected for this review are community-based and non-governmental pilot projects. Only a few of the studies are found documenting the sustainability challenges of the pilot projects. MOTECH pointed out the fact that the cost of free service may turn out unaffordable after the grant-funded pilot project end and poorest people may not be able to pay even the minimal charges to receive the messages (Grameen Foundation, 2011, p.43). In such a scenario, the mobile midwife service of MOTECH is susceptible to continue its smooth functioning. If the projects are not sustainable and efficient, there are chances that people may lose trust and confidence to use the services.

Aid leap (2014) gives an interesting example as to the multiplying of mHealth pilots in Uganda. It states that between 2008 and 2009, around 23 mHealth initiatives were unable to scale up due to the shrinking budget (Image of Ugandan mHealth Projects is attached in Annex). Those mHealth projects were vilified with a term "pilotitis" - a label to express a scenario where multiple pilot projects detachably engage for the relatively similar causes and cannot scale up any longer independently thereby leaving the project dysfunctional. That's the reason Grameen Foundation (2011) emphasized the collaboration with the government for the further execution of the project rather than running the multiple pilot programs for a parallel cause. Therefore, the substantial pragmatic evidence illustrating feasibility factors like input and output cost, proper health outcomes and examination of other socioeconomic

variables are crucial for the possibility of integration of pilot projects in national health systems. Thus, the critical insight into a mobile phone, reproductive health, and gender has to some extent unveiled the issues and challenges to acknowledge for better future of mHealth from diverse angles.

Thus, the customary practice of patriarchal norms, values and the belief system in SSA seems to have standardized the veiled control of male in decisions making concerning both men and women's body and mind. Both femininity and masculinity deserve empowerment on the same foot but not at the expense of each other's devaluations. This review is an attempt to understand the expression of patriarchy through the use of technology in a new form as Holter explained. Hesse-Biber explains that many feminist strive for the political pedestal of knowledge construction in their research process as socially constructed knowledge demands political (or legislative) means to put into action. Feminist research, thus, aim for social reconstruction from academia towards a paradigm shift (Hesse-Biber, 2004, p.224). This review can be thought provoking for gender inclusive mHealth initiatives to sensitize women and men to compromise with the standard normative gender behavior that is less sexist and less stereotyped on a day to day life.

7. Suggestions

After having dug out the perceived mHealth use barriers from all the selected reviews, I found that mHealth requires multi-sectoral breakthrough addressing social, economic and infrastructural challenges. Along with this, I suggest mHealth interventions to prioritize a gender-balanced approach to reproductive healthcare. That is mHealth interventions should equally call men for voicing women's sexual and reproductive health concerns for child health depends upon mother's access to proper health knowledge, nutrition and health care. For benefitting both men and women alike from mHealth requires an enduring effort and practices rather than quick-fix.

Similarly, mHealth studies should highlight the left behind issues that most of the mHealth interventions studied in this review has not brought into light. Some of those matters are the inside story concerning the effect of mHealth on marginalized and inaccessible population; feasibility studies before implementing the mHealth project; situation before the introduction of mobile-based health services and cost issues as to sustain the mHealth project. On the one hand, the development of health care system through mobile phones has caught the eye of

stakeholders to harness its best potential. But on the other hand, to extend it to the poor communities beyond urban areas is laden with challenges. Therefore, mHealth interventions should have a concrete plan to tackle the problems that surface out of baseline study before implementing the costly mHealth projects. One of the possible measures to address the mHealth challenges is to collaborate with concerned stakeholders. The Mobile Health (mHealth) ecosystem is a broad web of stakeholders that all need to provide their particular input to fully utilize the possibilities of mHealth services (Deloitte, 2014, p.3). The collaborative approach should be embraced to tackle fundamental social, infrastructural and project Sustainability challenges.

In the selected studies, the benefits that pilot projects have displayed is to ensure the adequate exposure to mHealth information, especially in areas with poor access to information. Getting access to information is, in fact, the first step to care and prevent complications. This potential of mHealth can urge stakeholders like government and other concerned sectors to seek the tangible mHealth impact. Therefore, researcher should present clear cut more tangible impacts of mHealth so that mHealth would be considered assessment worthy for the integration of mHealth into the national health systems. Plans for integrating mHealth pilots projects in the national system should be carried out with considerable analysis of cost-benefit, human resources, equipment and supplies, monitoring and evaluation, hence all requiring an ample budget. Whether or not the respective government is capable and willing to taking the responsibility is also a concern to ponder about for mHealth stakeholders. Reproductive health should not be treated merely as health issue only; it should be addressed aggregately with biological, psycho-social, cultural and political factors for making a healthy African society. The concerned government should also be responsive, and cooperative to the local and non-governmental mHealth initiatives rather than controlling them to implement the mHealth projects like in Uganda (see p.79). Thus, the concerned stakeholder's smart actions can change the way we think about reproductive health and gender in Sub Saharan African Countries.

References

- AbouZahr C, Wardlaw T. (2001) *Maternal mortality at the end of a decade: signs of progress? Bull World Health Organ*; Vol. 79, pp.561–68.
- Aker, J. C., & Mbiti, I. M. (2010). Mobile Phones and Economic Development in Africa. *Journal of Economic Perspectives—Volume, 24*(3—Summer), 207–232. <https://doi.org/10.1257/jep.24.3.207>
- Assié, L. and N’Dri, T. (2005) *Gender and Emerging Challenges in Educational policy and the Public Sector, African Women and Globalization: Dawn of the 21st Century*. Ed. Jepkorir R. Chepyator-Thomson. Trenton: African World, pp.43-66
- Ås, Berit (1979). “*De fem hersketeknikker – om ufarliggjøring av undertrykkerens våpen*”. *Årbog for kvinderet*, København: Kvinderetlig Skriftserie.
- Bazeley, P. and Jackson, K. (2013) *Qualitative Data Analysis with Nvivo*. Sage Publications Ltd
- Berer, M. (1996) Men. Reproductive Health Matters, *An international journal on sexual and reproductive health and rights*. 7, pp.7–10 [http://dx.doi.org/10.1016/S0968-8080\(96\)90000-2](http://dx.doi.org/10.1016/S0968-8080(96)90000-2)
- Blanc, A. K., Glazer, K., Ofomata-Aderemi, U., & Akinfaderin-Agarau, F. (2016). Myths and Misinformation: An Analysis of Text Messages Sent to a Sexual and Reproductive Health Q&A Service in Nigeria. *Studies in Family Planning, 47*(1), 39–53. <https://doi.org/10.1111/j.1728-4465.2016.00046.x>
- Boland, Angela, et al. (2014) *Doing a Systematic Review: a Student's Guide*. SAGE.
- Braun, V. and Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*: 77-101.
- Bryman, Alan (2012) *Social Research Methods - 4th Ed*. OXFORD UNIVERSITY PRESS
- Chib, A., van Velthoven, M. H., & Car, J. (2015). mHealth Adoption in Low-Resource Environments: A Review of the Use of Mobile Healthcare in Developing Countries.

Journal of Health Communication, 20(1), 4–34.

<https://doi.org/10.1080/10810730.2013.864735>

Cole-Lewis, H., & Kershaw, T. (2010). Text messaging as a tool for behavior change in disease prevention and management. *Epidemiologic Reviews*.

<https://doi.org/10.1093/epirev/mxq004>

Combs Thorsen V, Sundby J, Malata A. Piecing together the maternal death puzzle through narratives: the three delays model revisited. *PLoS One*. 2012;7(12): e52090.

CrossRef. Medline

Cormick, G., Kim, N. A., Rodgers, A., Gibbons, L., Buekens, P. M., Belizán, J. M., & Althabe, F. (2012). Interest of pregnant women in the use of SMS (short message service) text messages for the improvement of perinatal and postnatal care.

Reproductive Health, 9(1), 9. <https://doi.org/10.1186/1742-4755-9-9>

Cochrane (2014): *Data collection forms for intervention reviews* [online] – URL

<http://training.cochrane.org/resource/data-collection-forms-intervention-reviews>

Crawford, J., Larsen-Cooper, E., Jezman, Z., Cunningham, S. C., & Bancroft, E. (2014). SMS versus voice messaging to deliver MNCH communication in rural Malawi: assessment of delivery success and user experience. *Global Health, Science and Practice*, 2(1), 35–46. <https://doi.org/10.9745/GHSP-D-13-00155>

Deloitte The Netherlands (2014): *The opportunity of mHealth in Sub-Sahara Africa “The path towards practical application”* [online] - URL <https://www2.deloitte.com/content/dam/Deloitte/nl/Documents/technology-media-telecommunications/deloitte-nl-mhealth.pdf> (retrieved on 28 June, 2017)

Richards, Sam and Saba, Paul (1990) Basis of Women’s Oppression, *Encyclopaedia of Anti-Revisionism On-Line, Revolutionary Communist League*, vol. 5.

<https://www.marxists.org/history/erol/uk.hightide/basis.htm>

(retrieved on: 20th September, 2017)

Engle, B. K. L., & Vadhat, H. (2010). Mobile Phone Interventions for Reproductive Health (m4RH): Testing the Feasibility of Text Messaging to Improve Family Planning. *Reproductive Health*, (June 2009), pp.40–42

- Fiander, A. N., & Vanneste, T. (2012). Transport *MY* patient: an initiative to overcome the barrier of transport costs for patients accessing treatment for obstetric fistula and cleft lip in Tanzania. *Tropical Doctor*, 42(2), 77–79.
<https://doi.org/10.1258/td.2011.110423>
- Fedha, T. (2014). Impact of Mobile Telephone on Maternal Health Service Care: A Case of Njoro Division. *Open Journal of Preventive Medicine*, 4(5), 365–376.
<https://doi.org/10.4236/ojpm.2014.45044>
- FRANK DIANA'S BLOG (2016): *Techno-Optimist or Techno-Pessimist?* [online] – URL
<https://frankdiana.net/2016/10/10/techno-optimist-or-techno-pessimist/>
(retrieved on 5th December, 2016)
- Federal Ministry for Economic Cooperation and Development Germany: *Marshall Plan with Africa: Sub-Saharan Africa - Fostering regional cooperation* [online] - URL
https://www.bmz.de/en/countries_regions/subsahara/index.html
(retrieved on 7 May, 2017)
- Grameen Foundation. (2011). Mobile Technology for Community Health in Ghana. Statistics, (March), 1–85. Retrieved from
<http://www.grameenfoundation.org/sites/default/files/MOTECH-Early-Lessons-Learned-March-2011-FINAL.pdf>
- Gallen, M. E., Liskin, L., & Kak, N. (1986). Men--new focus for family planning programs. Population Reports. Series J, Family Planning Programs, (33), pp.889-919.
- Gurman, T. A., Rubin, S. E., & Roess, A. A. (2012). Effectiveness of mHealth behavior change communication interventions in developing countries: A systematic review of the literature. *Journal of Health Communication*.
<https://doi.org/10.1080/10810730.2011.649160>
- Hampshire, K., Porter, G., Owusu, S. A., Mariwah, S., Abane, A., Robson, E., Milner, J. (2015). Informal m-health: How are young people using mobile phones to bridge healthcare gaps in Sub-Saharan Africa? *Social Science and Medicine*, 142, pp.90–99.
<https://doi.org/10.1016/j.socscimed.2015.07.033>
- Harding, Sandra (1986) *The Science Question in Feminism*. Cornell University Press.

- Harding, Sandra (1987) Introduction: Is there a feminist method? In *Feminism and Methodology*. Sandra Harding, 1-14. Bloomington: Indiana University Press.
- Haslanger, S. (2000). Gender and race:(what) are they?(What) do we want them to be? *Nous*, 34(1), 31–55. <https://doi.org/10.1111/0029-4624.00201>
- Helzner, J. (1996) Men's involvement in family planning, *Reproductive Health Matters*, Vol.7, 46-54
- Hesse-Biber, Sharlene Nagy(2004) *Feminist Perspectives on Social Research*. Oxford Univ. Press.
- Howitt, P., Darzi, A., Yang, G. Z., Ashrafian, H., Atun, R., Barlow, J., Wilson, E. (2012). Technologies for global health. *The Lancet*, 380(9840), pp.507–535. [https://doi.org/10.1016/S0140-6736\(12\)61127-1](https://doi.org/10.1016/S0140-6736(12)61127-1)
- Huq, N. L., Azmi, A. J., Quaiyum, M., & Hossain, S. (2014). Toll free mobile communication: overcoming barriers in maternal and neonatal emergencies in Rural Bangladesh. *Reproductive Health*, 11(1), 52. <https://doi.org/10.1186/1742-4755-11-52>
- Holter, Harriet (1976) "Om kvinneundertrykkelse, mannsundertrykkelse og hersketeknikker". I: Støren, Thordis og Tone Schou Wetlesen (red). *Kvinnekunnskap*. Oslo: Gyldendal. s. 61-82 translated by Myriam G. Kepple, Centre for gender research, University of Oslo (2016).
- Hesse-Biber, Sharlene Nagy., and Michelle L. Yaiser(2004). *Feminist Perspectives on Social Research*. Oxford University Press
- Hemphill, Amelia Martyn (2017) "People Fixing the World, How Cervical 'Selfies' Are Fighting Cancer in The Gambia." BBC World Service, BBC, 3 Oct., www.bbc.co.uk/programmes/p05hhryr
- Haslanger, S. (2000). Gender and race:(what) are they?(What) do we want them to be? *Nous*, 34(1), 31–55. <https://doi.org/10.1111/0029-4624.00201>
- Independent (2016) *Men call Sweden's mansplaining hotline to mansplain why they don't like it* [online] - URL <http://www.independent.co.uk/news/world/europe/sweden->

[mansplaining-hotline-sexist-men-dominate-lines-blocked-for-women-colleagues-a7431201.html](https://doi.org/10.1186/s12911-015-0201-1)

Institute of Medicine (2004) *Health Literacy: A Prescription to End Confusion*. Washington, D.C: National Academies Press.

Jayarathne, T. E., & Stewart, A. J. (1991). Quantitative and qualitative methods in the social sciences: current feminist issues and practical strategies. In M. M. Fonow & J. A. Cook (Eds.), *Beyond methodology: feminist scholarship as lived research* (pp. 85-106). Bloomington, IN: Indiana University Press.

John, L., Snow, D. A., Anderson, L., & Lofland, L. H. (1971). *Analyzing social settings*. Belmont, CA: Wadsworth, 181–203. <https://doi.org/10.1177/089124196025003006>

Kaewkungwal, J., Singhasivanon, P., Khamsiriwatchara, A., Sawang, S., Meankaew, P., & Wechsart, A. (2010). Application of smart phone in “Better Border Healthcare Program”: A module for mother and child care. *BMC Medical Informatics and Decision Making*, *10*(1), 69. <https://doi.org/10.1186/1472-6947-10-69>

Kraft, J. M., Wilkins, K. G., Morales, G. J., Widyono, M., & Middlestadt, S. E. (2014). An evidence review of gender-integrated interventions in reproductive and maternal-child health. *Journal of Health Communication*, *19 Suppl 1*(February 2015), 122–41. <https://doi.org/10.1080/10810730.2014.918216>

Labrique, A. B., Vasudevan, L., Kochi, E., Fabricant, R., & Mehl, G. (2013). mHealth innovations as health system strengthening tools: 12 common applications and a visual framework. *Global Health, Science and Practice*, *1*(2), 160–71. <https://doi.org/10.9745/GHSP-D-13-00031>

Lofland, J., & Lofland, L. (1995). Developing analysis. In *analyzing social settings: A guide to qualitative observation and analysis* (pp. 181–203).

L’Engle, K., Raney, L., & D’Adamo, M. (2014). mHealth resources to strengthen health programs. *Global Health: Science and Practice*, *2*(1), 130–131. <https://doi.org/10.9745/GHSP-D-14-00013>

Obasola, O. I., Mabawonku, I., & Lagunju, I. (2015). A Review of e-Health Interventions for Maternal and Child Health in Sub-Sahara Africa. *Maternal and Child Health Journal*.

<https://doi.org/10.1007/s10995-015-1695-0>

- Lund, S., Hemed, M., Nielsen, B. B., Said, A., Said, K., Makungu, M. H., & Rasch, V. (2012). Mobile phones as a health communication tool to improve skilled attendance at delivery in Zanzibar: A cluster-randomised controlled trial. *BJOG: An International Journal of Obstetrics and Gynaecology*, 119(10), 1256–1264. <https://doi.org/10.1111/j.1471-0528.2012.03413.x>
- Mason, J. (2002). Qualitative Interviewing. In *Qualitative Researching* (p. 236). Retrieved from <http://books.google.fr/books?id=ot5zndXhrNEC>
- Nacinovich, M. (2011). Defining mHealth. *Journal of Communication in Healthcare*, 4(1), 1–3. <https://doi.org/10.1179/175380611X12950033990296>
- Neyer, Gerda, et al. (2013). “Gender Equality and Fertility: Which Equality Matters?” *European Journal of Population / Revue Européenne De Démographie*, vol. 29, no. 3, July 2013, pp. 245–272., doi:10.1007/s10680-013-9292-7.
- Ngabo, F., Nguimfack, J., Nwaigwe, F., Mugeni, C., Muhoza, D., Wilson, D. R., Binagwaho, A. (2012). Designing and Implementing an Innovative SMS-based alert system (RapidSMS-MCH) to monitor pregnancy and reduce maternal and child deaths in Rwanda. *The Pan African Medical Journal*, 13, 31. <https://doi.org/10.11604/pamj.2012.13.31.1864>
- L’Engle, K., Raney, L., & D’Adamo, M. (2014). mHealth resources to strengthen health programs. *Global Health: Science and Practice*, 2(1), 130–131. <https://doi.org/10.9745/GHSP-D-14-00013>
- Obasola, O. I., Mabawonku, I., & Lagunju, I. (2015). A Review of e-Health Interventions for Maternal and Child Health in Sub-Sahara Africa. *Maternal and Child Health Journal*. <https://doi.org/10.1007/s10995-015-1695-0>
- Omole, O., Ijadunola, M. Y., Olotu, E., Omotoso, O., Bello, B., Awoniran, O., Fatusi, A. (2017). The effect of mobile phone short message service on maternal health in south-west Nigeria. *The International Journal of Health Planning and Management*, (December 2016), 1–16. <https://doi.org/10.1002/hpm.2404>
- Olla, P., & Shimskey, C. (2015). mHealth taxonomy: a literature survey of mobile health

applications. *Health and Technology*, 4(4), 299–308. <https://doi.org/10.1007/s12553-014-0093-8>

Oyeyemi, S. O., & Wynn, R. (2014). Giving cell phones to pregnant women and improving services may increase primary health facility utilization: a case-control study of a Nigerian project. *Reproductive Health*, 11(1), 8. <https://doi.org/10.1186/1742-4755-11-8>

Partnership Profile (2012) Project Mwana: Using mobile technology to improve early infant diagnosis of HIV UNICEF Zambia.

URL https://www.unicef.org/partners/Partnership_profile_2012_Mwana_Zambia_V2_approved.pdf (Retrieved on 5th September, 2017)

POPIN(n.d.) Guidelines on Reproductive Health, UN Population Division, Department of Economic and Social Affairs, with support from the UN Population Fund (UNFPA), Task Force on ICPD Implementation, 220 East 42nd Street, New York, NY 10017 USA, No Date available on guideline

Pew Research Center (2015) Cell Phones in Africa: Communication Lifeline. Pew Research Center: Washington, DC.

PWC - PricewaterhouseCoopers Private Limited (2013): *Connected Life “The impact of the Connected Life over the next five years”* [online] – URL https://www.gsma.com/iot/wp-content/uploads/2013/02/GSMA-Connected-Life-PwC_Feb-2013.pdf (retrieved on 1 July, 2016)

Reinharz, Shulamit(1992) *Feminist Methods in Social Research*. Oxford Univ. Press

Ring N, Ritchie K, Mandava L, Jepson R. (2010) A guide to synthesizing qualitative research for researchers undertaking health technology assessments and systematic reviews, NHS,Scotland <http://www.nhshealthquality.org/nhsqis/8837.html>

Rokicki, S., Cohen, J., Salomon, J. A., & Fink, G. (2016). Impact of a Text-Messaging Program on Adolescent Reproductive Health: A Cluster–Randomized Trial in Ghana. *American Journal of Public Health*, 107(2), e1–e8. <https://doi.org/10.2105/AJPH.2016.303562>

- Ratzan, S. C., and R. M. Parker (2000) "Introduction." in National Library of Medicine Current Bibliographies in Medicine: Health Literacy. National Institutes of Health, U.S. Department of Health and Human Services.
- Roush et al. (2012) "Obstetric Fistula: What about Gender Power?" *Health Care for Women International*, vol. 33, no. 9, pp. 787–798, doi:10.1080/07399332.2011.645964.
- Ryan, G.W., and Bernard, H.R.(2003). Techniques to Identify Themes, Field Methods, Vol.15, pp. 85-109
- Sabatier, P. a. (1986). Top-Down and Bottom-Up Approaches to Implementation Research: a Critical Analysis and Suggested Synthesis. *Journal of Public Policy*, 6(1), 21.
<https://doi.org/10.1017/S0143814X00003846>
- Sternberg, P., & Hubley, J. (2004). Evaluating men's involvement as a strategy in sexual and reproductive health promotion. *Health Promotion International*.
<https://doi.org/10.1093/heapro/dah312>
- Strauss, A. L. (1987). Qualitative analysis for social scientists. *World*, 1, 319.
<https://doi.org/10.1017/CBO9780511557842>
- Shoola, Toni (2014) "The Effect of the Sub-Saharan African Gender Divide on the Rights and Status of Women in a Globalized World," *International Research Scape Journal*: Vol. 1, Article 7. Available at: <http://scholarworks.bgsu.edu/irj/vol1/iss1/7>
- Tamrat, T., & Kachnowski, S. (2012). Special delivery: An analysis of mhealth in maternal and newborn health programs and their outcomes around the world. *Maternal and Child Health Journal*, 16(5), 1092–1101. <https://doi.org/10.1007/s10995-011-0836-3>
- Thomas, James, & Harden, Angela. (2008). Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Medical Research Methodology*, 8(1), 45.
<https://doi.org/10.1186/1471-2288-8-45>

The Borgen Project (2016) The “Three Delays” at the Root of Maternal Mortality

<https://borgenproject.org/the-three-delays-maternal-mortality/>

(retrieved on 23rd August 2016)

Unit, Economist Intelligence (2012) *The future of healthcare in Africa* A report from the Economist Intelligence Unit sponsored by Janssen.

USAID - The United States Agency for International Development (2012): *mHealth Compendium, Edition One* [online] - URL

https://www.mhealthworkinggroup.org/sites/mhealthwg.org/files/usaids_ash-mhealthcompendium.pdf (retrieved on 15 June, 2016)

USAID - The United States Agency for International Development (2012): *mHealth Compendium, Volume Two, TECHNICAL REPORT* [online] – URL

https://www.mhealthworkinggroup.org/sites/mhealthwg.org/files/usaids_mhealth_compendium_vol_2_-_final_0.pdf (retrieved on 15 June, 2016)

USAID - The United States Agency for International Development (2013): *mHealth Compendium, Volume Three, TECHNICAL REPORT* [online] - URL

https://www.mhealthworkinggroup.org/sites/mhealthwg.org/files/mhealth_compendium_volume_3_a4_small.pdf (retrieved on 15 June, 2016)

University of Illinois at Chicago: *Evidence Based Medicine: PICO* [online] – URL

<http://researchguides.uic.edu/c.php?g=252338&p=3954402>

Voices of Africa (2013): *Culture, patriarchy and the Shona woman's curtsey* [online] - URL

<http://voicesofafrica.co.za/culture-patriarchy-and-the-shona-womans-curtsey/>

(retrieved on 10th July 2016)

Wajcman, Judy (1991) *Feminism Confronts Technology*. Polity Press, UK.

Woog V, Singh S, Browne A, Philbin J. (2015) *Adolescent Women's Need for and Use of Sexual and Reproductive Health Services in Developing Countries*. New York: Guttmacher Institute

World Health Organization (WHO) *Trends in Maternal Mortality: 1990 to 2013*. Geneva:

WHO, UNICEF, UNFPA, The World Bank and the United Nations Population

Division; 2014

http://apps.who.int/iris/bitstream/10665/112682/2/9789241507226_eng.pdf?ua=1

World Health Organization (2014) Why Gender and Health? Retrieved July 29, 2017, from
<http://www.who.int/gender-equity-rights/en/>

World Health Organization (2014) Making Maternal and Child Health Care more accessible
in Nigeria: Pathfinder International's M4Change2, *Innovation Catalyst*, For further
information Farouk Jega, Country Representative Nigeria (fjega@pathfinder.org)

World Health Organization (2016): *Maternal mortality* [online] – URL
<http://www.who.int/mediacentre/factsheets/fs348/en/> (retrieved on April 11, 2016)

Annexes

Annex 1: Table Extraction from Nvivo 11 displaying the "Themes"

Table 1: The table below is extracted directly from Nvivo 11 just for the sake of the glimpse regarding how the themes were coded. Nodes are synonymous to the Themes in the table:

Nodes (Themes)	Number of coding references	Aggregate number of coding references	Number of items coded	Aggregate number of items coded
Nodes\Application of mHealth Services	31	31	6	6
Nodes\Challenges of and during intervention	40	40	4	4
Nodes\Characteristics of participants(men women health workers)	5	5	2	2
Nodes\Delays	14	17	5	6
Nodes\Delays\Phase I Delay	3	3	2	2
Nodes\Gender Issues	33	33	4	4
Nodes\General Data	11	11	3	3
Nodes\Implication of Access to resources	37	37	5	5

Nodes\Intervention Outcome	8	8	3	3
Nodes\Methodological Issues	7	7	2	2
Nodes\Miscellaneous	17	17	5	5
Nodes\Miscellaneous\Untitled	0	0	0	0
Nodes\Miscellaneous\Untitled (2)	0	0	0	0
Nodes\Misconception and beliefs	6	6	1	1
Nodes\privacy	4	4	1	1
Nodes\Procedure of mHealth	32	32	5	5
Nodes\Queries by Women	8	8	1	1
Nodes\Situation before mHealth Intervention	14	14	5	5
Nodes\Socioeconomic Issues	3	3	1	1
Nodes\Strengths	17	17	2	2
Nodes\Suggestions	12	12	4	4
Nodes\tables and figures	13	13	3	3
Nodes\Urban Rural	3	3	1	1

Annex 2: Images

Image 1: Screenshot displaying Coding Technique from Qualitative Research Software NVIVO 11

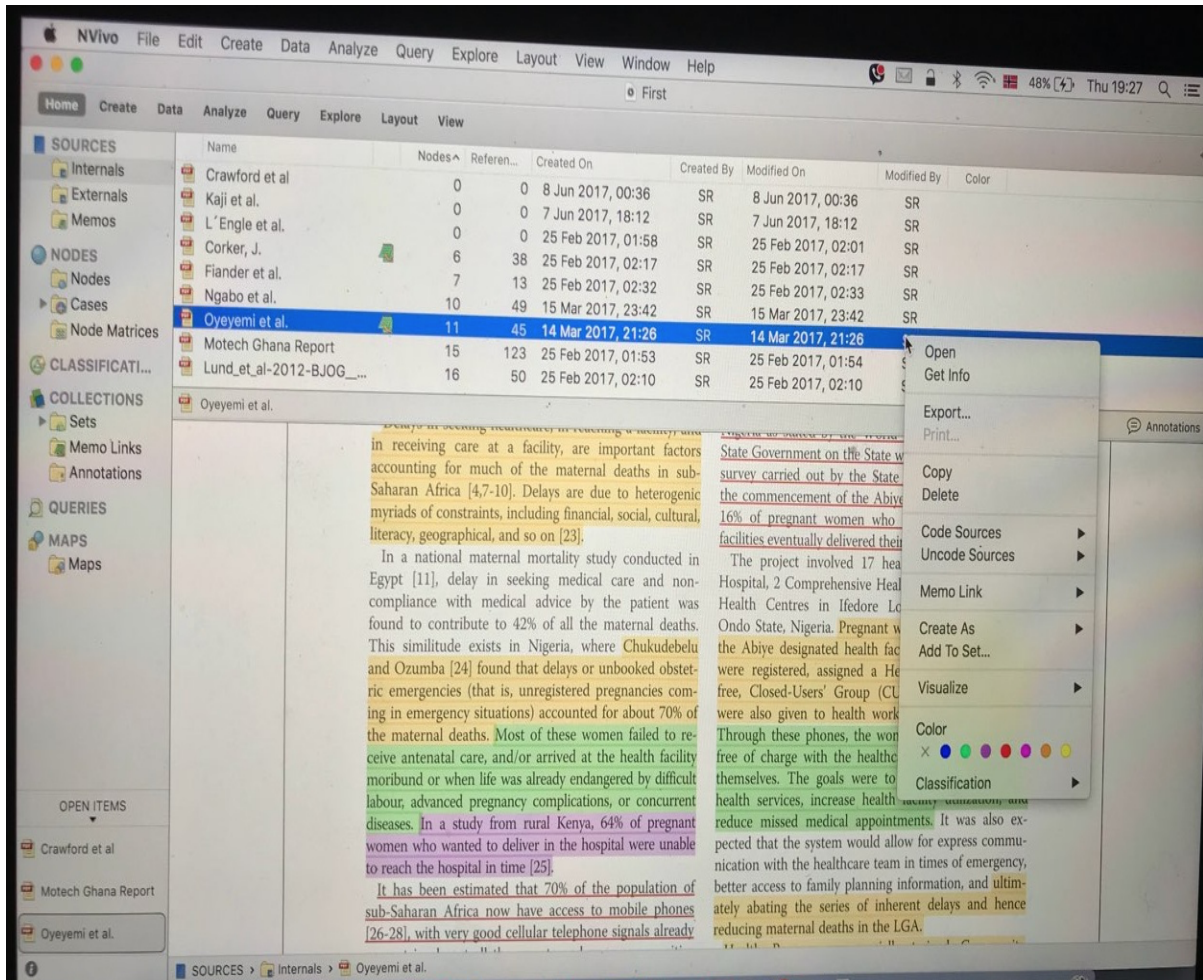
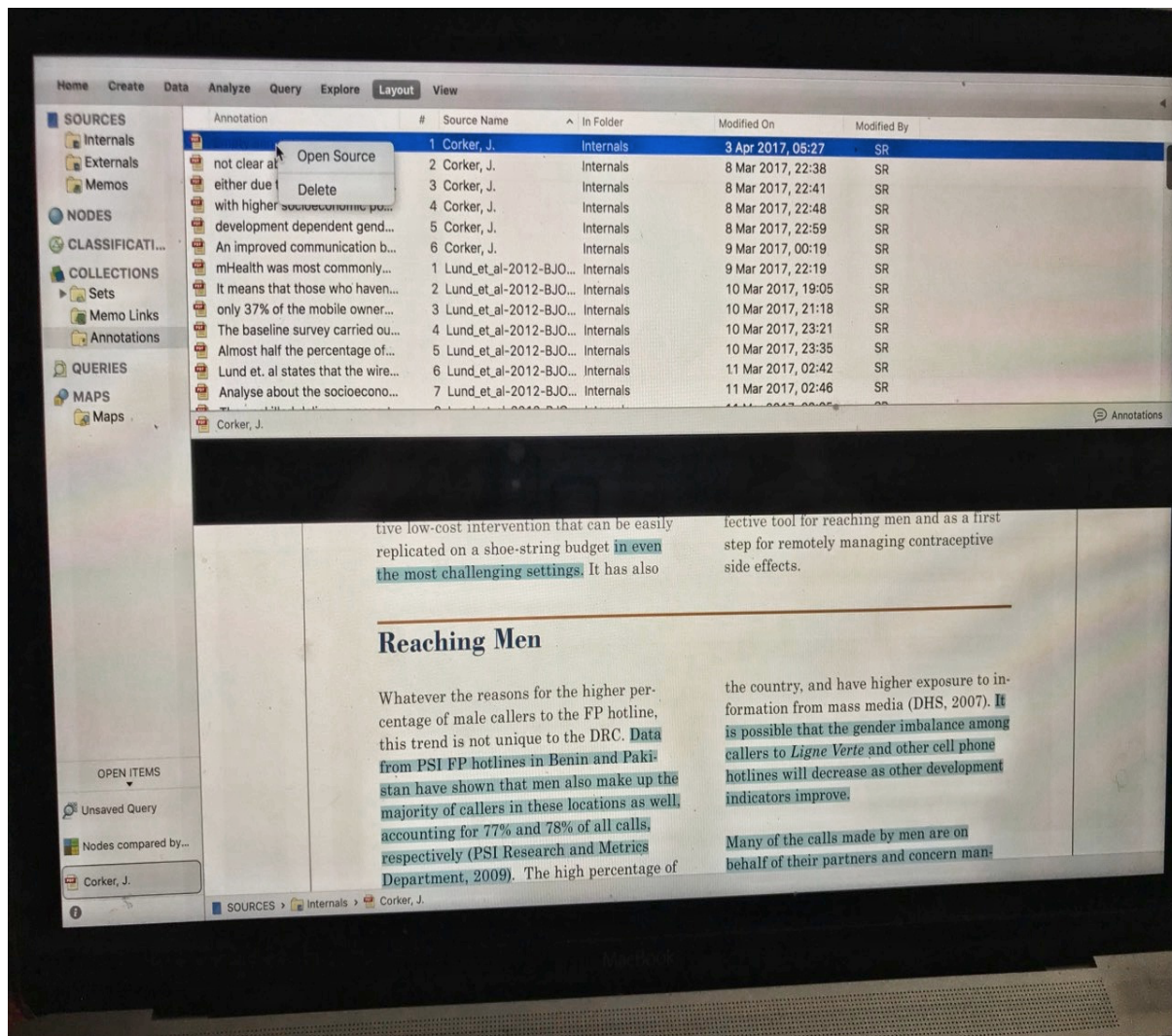


Image 2: Screenshot displaying Coding Technique from Qualitative Research Software NVIVO 11



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