

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

KUMASI, GHANA

COLLEGE OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

**DEPARTMENT OF HEALTH POLICY, MANAGEMENT AND
ECONOMICS**

**FEASIBILITY AND ACCEPTABILITY OF THE USE OF MOBILE
TECHNOLOGY FOR ADOLESCENT COUNSELING IN SEXUAL AND
REPRODUCTIVE HEALTH IN THE AMANSIE WEST DISTRICT (RURAL
DISTRICT IN GHANA)**

BY:

ERIC AKOSAH

NOVEMBER, 2016

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DISTRICT IN GHANA)**

BY

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**A THESIS SUBMITTED TO THE DEPARTMENT OF HEALTH POLICY,
MANAGEMENT AND ECONOMICS,
COLLEGE OF HEALTH SCIENCES, SCHOOL OF PUBLIC HEALTH, IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF PUBLIC HEALTH IN HEALTH SERVICE PLANNING AND
MANAGEMENT**

NOVEMBER, 2016

DECLARATION

I hereby do declare that except for the references to other people's work which has been duly acknowledged, this piece of work is my own composition and neither in whole nor in part has this work been presented for the award of a degree in this university or elsewhere.

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DEDICATION

This work is dedicated to my deceased mum, Sarah Duah for her good parenting even as a single mother and her enormous contribution in my education. I also wish to mention my dear wife Mrs. Joana Akosah and my children Nana Afia Kwane Akosah, Afia Agyemang Akosah and Sekyere Marfo Akosah for their love and support. May the Almighty God bless them.



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Last but not least, I thank Mr. Amos Adusei, M&E Manager of MVP, Mr. Nicholas Addofo, KCCR-KNUST and Mr. Reindolf Anokye of Garden City University, Kenyasi-Ghana for their valuable support to this work.

DEFINITION OF TERMS

Feasibility: Possibility of using mobile technology to address issues related to sex and reproduction

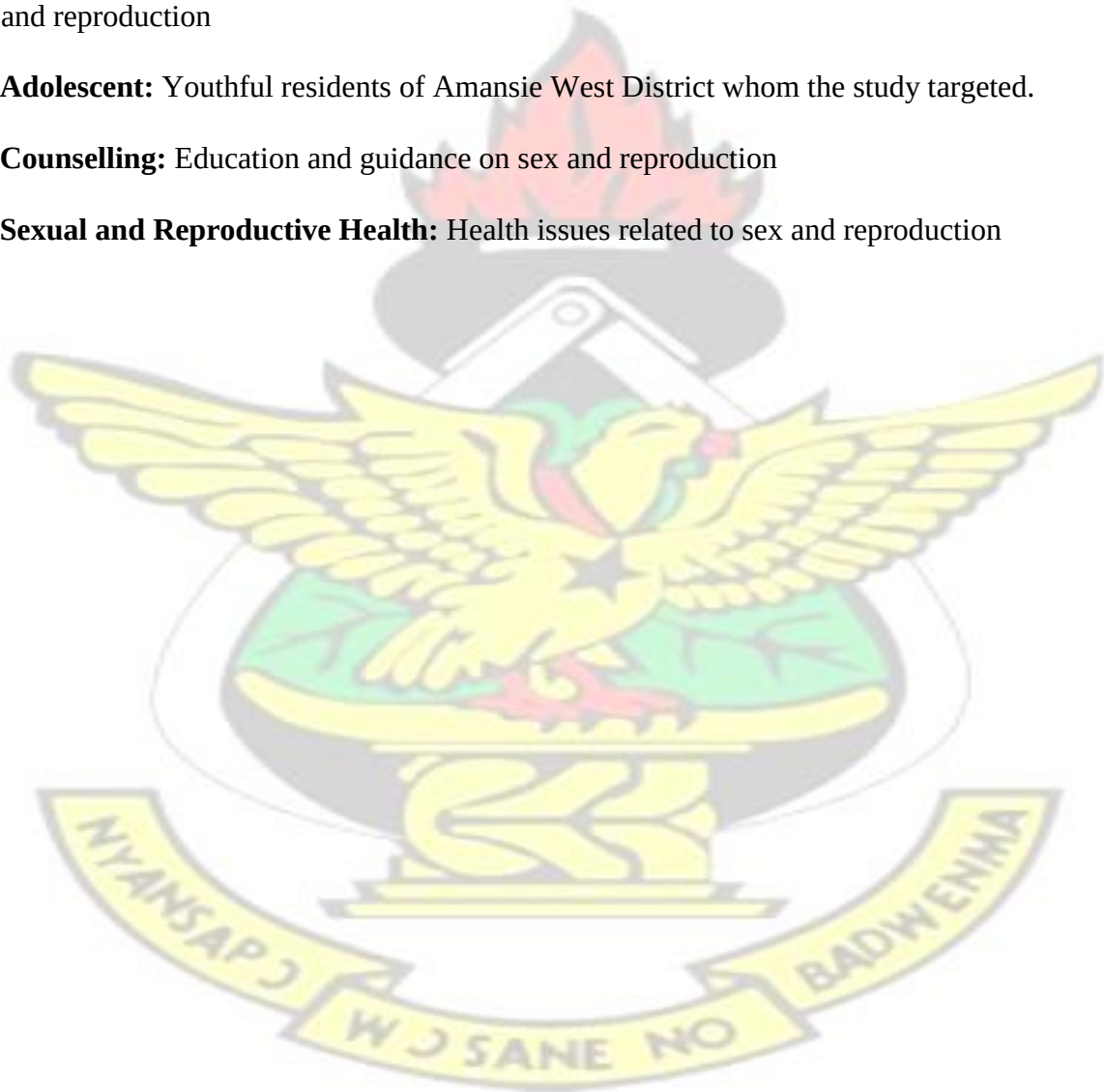
Acceptability: Sustainability of using mobile technology to address issues related to sex and reproduction

Mobile Technology: Portable equipment that can be used to address issues related to sex and reproduction

Adolescent: Youthful residents of Amansie West District whom the study targeted.

Counselling: Education and guidance on sex and reproduction

Sexual and Reproductive Health: Health issues related to sex and reproduction



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ABBREVIATIONS/ACRONYMS

STI	-	Sexually Transmitted Infection
HIV	-	Human Immunodeficiency Virus
AIDS	-	Acquired Immune Deficiency Syndrome
MDGs	-	Millennium Development Goals
UNICEF	-	United Nations International Children Emergency Fund
UNFPA	-	United Nations Population Fund Agency
WHO	-	World Health Organization
TML	-	Technology-Mediated Learning and
AT	-	Activity Theory
CSCL	-	computer-supported collaborative learning
BCC	-	Behavior Change Communication

MDNet	-	Mobile Doctors Network
ICT	–	Information Communication Technology
MOH	-	Ministry of Health
AAD	-	American Academy of Dermatology
GAN	-	Global Authentication Network
MoTeCH	–	Mobile Technology for Community Health
CHCs	-	Community Health Compounds
MVP	-	Millennium Villages Project
GOe	-	Global Observatory for eHealth
PDA	-	Personal Digital Assistants
DALY	-	Disability-Adjusted Life Year
Telcos	–	Telecommunication Operators



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ABSTRACT

Background: Recently, healthcare professionals and researchers have introduced more and more technological solutions into the healthcare system, particularly mobile Health (mHealth). The study sought to investigate the feasibility and acceptability of the use of mobile technology to address the sexual-reproductive health concerns of adolescents in rural district of Amansie West.

Method: The study adopted a cross-sectional design using both qualitative and quantitative approaches to collect data. A sample size of 425 respondents were used for the study.

A purposive sampling technique was also used to select stakeholders for the study. Adolescent between the ages of 10-21 years were selected from each sub-district by the use of simple random sampling technique. Both primary and secondary data were used for the study.

Results: The findings revealed that Majority of the respondents indicated that mobile network is available in their communities. Cost implications of the use of Mobile technology in Amansie West District is moderately low taking into consideration the cost

of the phone, recharge cards, power to charge the phones and the cost of repairs cumulatively. Majority of the respondents were of the view that Mobile phone would be the best medium for discussing reproductive health of adolescents. They further indicated that using mobile phone to address adolescents' health concerns will be effective due to its convenience. Stakeholders are interested in investing in tele-health for the adolescent in the district and they were of the view that mobile technology is appropriate for counseling adolescent on sexual reproduction as it will help reduce shyness, cost of traveling to the health facilities and help with keeping clients information confidential. Stakeholders in the health sector should advocate for the implementation of the use of mobile technology in addressing the health concerns of adolescents.

Conclusion: E-health is an important tool for adolescents counselling in sexual and reproductive health and feasible to roll out in underserved communities based on the availability of mobile infrastructure, interest of the stakeholders and its affordability.



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CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Access to health care, especially health care related to sensitive issues such as HIV/AIDS and adolescent reproductive health is bedeviled with low acceptance due to lack of privacy, confidentiality, stigma, operational cost, reduced customer satisfaction and consequently low uptake. Mobile Health (mHealth) technologies however, solve many of these challenges of running a healthcare business; they help healthcare providers and technicians to concentrate on the client increasing productivity and customer satisfaction, reducing stigma and above all reducing operational costs.

Recently, “healthcare professionals and researchers have introduced more and more technological solutions into the healthcare system, particularly mobile Health (mHealth). MHealth broadly encompasses healthcare related utilization of a mobile telecommunication and multimedia technologies within health service delivery and public health systems” (Istepanian & Lacal, 2003). “MHealth’s innovations in taking care of chronic patients significantly improve the monitoring of long-term diseases, patients’ selfmanagement, and autonomy” (Mair, Hiscock & Beaton, 2008). Often the willpower and modification of chronic illness treatment rely on patients’ reports of symptoms, side effects, and functional statuses. MHealth owns the feasibility to support data collection and conveying at any time, thus encouraging additional rapid convergence to optimal treatment (Estrin & Sim, 2010).

“MHealth is an integration of mobile technology’s advantages in healthcare system” (WHO, 2011). Mobile technology supports healthcare services in the part of “accessibility, effectiveness, and affordability” (Farhaan et al., 2008). More specifically, mHealth offers

reachable health services to patients, decreasing geographic and temporal barricades in the middle of patients and the healthcare professionals. Successful experiments and implementations also prove that mHealth is an effective intervention. For example, “an interface with mobile sensors for monitoring health index; high-resolution images for remote diagnosing; data tracking for client locating” (FREng, Sherrington, Dicks, Gray, & Chang, 2011). Additionally, “the popularity of mobile devices found a ground base for the affordability of mHealth services, i.e. patients do not need to purchase additional devices” (Patrick et al., 2008).

In the U.S.A text-messaging hotline called ‘SEXINFO’ targets African-American youth with details about HIV and local testing sites. In “its first 25 weeks, the hotline received more than 4,500 text messages, half of which led to service referrals. In a subsequent survey of 214 youth attending local clinics, knowledge of the SEXINFO program was associated with increased concern about STIs” (Apha Publications, 2007).

In India and Sri Lanka a cross-media life skills program (Learning about Living) empowering youth to study about sexual health matters on their own terms via mobile phones and an interactive eLearning platform, girls and boys can finally get their difficult questions answered quickly, accurately, and anonymously.

In Nigerian girls at risk of HIV are using One World’s Mobile4Good applications to access the key nuggets of information they need to improve their lives. Similar Mobile4Good path-breaking programmes that use mobile phones to help people improve their lives and livelihoods have been implemented in Senegal, Morocco, Kenya and India. (<http://oneworld.org/oldmobile4good>).

In Ghana and Liberia Vodafone and MTN through MDNet have put doctors in Close User Groups (CUGs) to enable these physicians who operate under extremely difficult clinical conditions to call their colleagues during emergencies, seeking / giving advice, incorporate

specialists, patient referrals, to make it easier for them to collaborate with other doctors working in their countries, thus mobile technology making it possible for doctors to deliver efficient services.

Mobile Technology for Community Health (MoTeCH), a joint initiative, between Grameen Foundation, Columbia University's Mailman School of Public Health and the Ghana Health Service, is “working to determine how best to use mobile phones to increase the quality and quantity of antenatal and neonatal care in rural Ghana” (MOTech Ghana, 2010).

Again, the Millennium Villages Project (MVP), Ghana; in collaboration with Novartis Foundation for Sustainable Development, the Earth Institute of the Columbia University, the Ghana Health Service and Ministry of Communication is implementing the Ghana Mobile Telemedicine Project in the Amansie West District with the aim of improving the state of the health of people living in poverty and suffering from illnesses in Ghana that can be cured or prevented by better access to primary health care through the use of information, communication and technology (Akosah, 2011).

Mobile electronic health tools such as “cell phones and telemedicine technologies are rapidly transforming the face and context of health care service delivery around the world. Currently, there are over 3.5 billion mobile phones in use across the globe; this figure is set to double in the next decade. At the same time, eHealth role in clinical care, education, research, and training in the health sector is expected to grow from continent to continent” (Merrill Lynch and International Telecom Union, 2008).

The sum of subscribers “below the age of 30 in South Asia is projected to rise by 30 per cent (to 380 million); sub-Saharan Africa is expected to have 108 million subscribers of under 30s, and Latin America, 188 million by 2012. This increased connectivity offers an

opportunity for young people to access knowledge and fulfill their right to information” (Brown, 2011).

Mobile usage is growing rapidly in Ghana and all over Africa, and it was projected that by the end of 2008, Africa was going to have 246 million mobile subscriptions and mobile penetration, which was going to rise from just five percent in 2003 to well over 30 percent in 2008 (International Telecom Union, 2009)

The availability and increased use in mobile telephony has improved phone-in segments during talk shows on radio and it is a common phenomenon that most people phone-in to ask questions and discuss critical issues affecting their livelihood. The youth in this generation are very adventurous and have much fun with electronic gadgets including mobile phones. As most adolescents are fond of telephone it may be an appropriate medium to deliver adolescent reproductive health. Interestingly, this growing interest in telephony has not been explored in delivering adolescent reproductive health care. While telephone has been extensively in human resource, marketing and some aspects of health care, its application in adolescent health is acutely low. The study, nonetheless, explored the feasibility and acceptability of delivering this health care through mhealth among adolescents.

1.2 Problem Statement

There is limited access and avenues that ensures privacy and confidentiality of the Ghanaian adolescent in addressing the rapid social, cognitive, emotional and physical changes that occur during this critical transitional period.

Socially and culturally, parents and even teachers in Ghana find it difficult to discuss sexuality with their wards just as the young adult also finds it difficult discussing with their parents or any adult about sexuality.

Nearly “33% Ghanaians are between the ages of 10 and 24” (Guttmacher, 2004). A lot of of “these young people are at risk or already struggling with the consequences of an unplanned pregnancies or a sexually transmitted infection (STI), including HIV/AIDS” (Guttmacher, 2004).

Most youth enter into illicit sex at early age, and sexual coercion is a common occurrence in the adolescents in Ghana; by age 20, 83% of women and 56% of men have had sex; four in 10 women and six in 10 men aged 12-24 have had more than one sexual partner. 25% of sexually experienced young women have ever been forced against their will to have sexual intercourse. 80% of females and 63% males, age between (15-19) years at present do not use any up-to-date method of contraception, and 30% of women and 39% of men aged 12-24 conduct abortions at home. (Guttmacher, 2004)

The Amansie West district saw increased trends in teenage (10 – 19yrs) pregnancies from 928 in 2008 to 1,433 in 2011 (DHIMS2). An average of 25 Basic School going girls between the ages of 12 and 16 are identified yearly as pregnant by the Gender Facilitator in the Amansie West Education Directorate and encouraged to go back to school after childbirth.

The study contends that if pragmatic steps are not taken to break the silence of sex and sexuality among the adolescent, the entire society stands at greater risk of not only getting well-groomed adults in future but also increasing teenage pregnancies, irresponsible parenting, endangering educational prospects and increased STIs burden. Again the attainment and sustainability of the MDGs will be in crisis since the adolescents are the immediate replacement of adults and the MDGs are silent on adolescent issues. It is against this background, that the study sought to advocate the advantage of the growing coverage of mobile network in low-and-middle income countries to explore new possibilities to address the challenges associated with adolescent sexuality and reproductive health in a

more accessible, quality, effective, efficient and costs effective manner using mobile technologies.

1.3 Rationale for the study

Adolescent behaviour is one of the most talked about issues all over the world but there seem to be no clear-cut policies and programmes in Ghana and in most parts of the globe. “Adolescents are physically the healthiest of all age groups. However, the rapid social, cognitive, emotional and physical changes that occur during this age can make this a critical and often difficult time period to negotiate” (Bravender et al., 2010).

The adolescents mostly feel shy and stigmatized to share their pressing health and social issues, not even to their parents, close relatives and teachers. They therefore result to peer advice, influence and pressure in an attempt to solving their challenges and problems. Adolescents in rural settings are more vulnerable to these social challenges, which cannot be left unattended to.

The study sought to explore the feasibility and possibility of how mobile technologies could be used to break the myth, the silence and the fear of stigma the adolescents are faced with. The study further explored the socio-cultural acceptability of mobile technology in addressing sexual reproductive challenges among the rural Ghanaian adolescent.

1.4 Research Questions

The key research questions that guided the study were:

1. What is the Availability of Mobile Infrastructure in Amansie West District?
2. What are the Cost implications in the use of Mobile technology in Amansie West District?

3. What is the Interest of Adolescent in the usage of technology as a tool for addressing sexual reproductive challenges?
4. What is the Interest among Stakeholders in Health and education in the use of technology as a tool addressing sexual reproductive challenges?

1.5 Research Hypothesis

H_0 : Mobile technology does not provide the best option to address the health concerns of the adolescents in Ghana due to Availability of Mobile Infrastructure.

H_1 : Mobile technology provides the best option to address the health concerns of the adolescents in Ghana due to Availability of Mobile Infrastructure.

H_0 : Mobile technology does not provide the best option to address the health concerns of the adolescents in Ghana due to the use of Mobile technology in Amansie West District.

H_2 : Mobile technology provides the best option to address the health concerns of the adolescents in Ghana due to the use of Mobile technology in Amansie West District.

H_0 : Mobile technology does not provide the best option to address the health concerns of adolescents due to the Interest in the use of technology as a tool for addressing sexual reproductive challenges

H_3 : Mobile technology provides the best option to address the health concerns of adolescents due to the Interest in the use of technology as a tool for addressing sexual reproductive health issues

H0: Mobile technology does not provide the best option to address the health concerns of adolescents due to the Interest among Stakeholders in the use of technology as a tool for addressing sexual reproductive health issues.

H4: Mobile technology provide the best option to address the health concerns of adolescents due to the Interest among Stakeholders in the use of technology as a tool for addressing sexual reproductive health issues.

1.6 Research objective

1.6.1 General Objective:

To investigate feasibility and acceptability of the use of mobile technology to address the sexual-reproductive health concerns of adolescents in rural district of Amansie West.

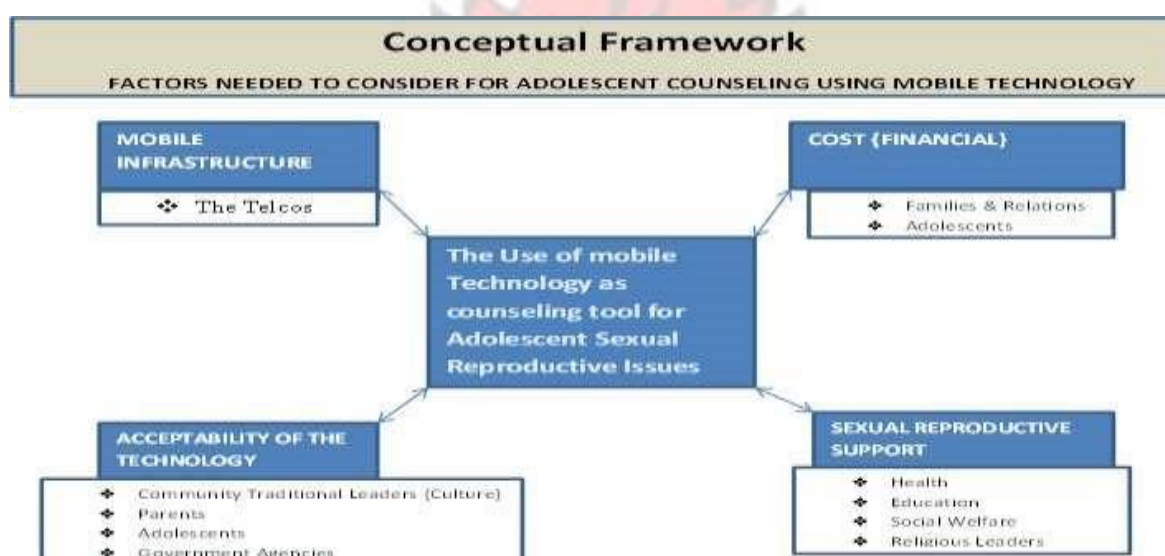
1.6.2. Specific Objectives

1. To determine the Availability of Mobile Infrastructure in Amansie West District.
2. To determine the Cost implications in the use of Mobile technology in Amansie West District.
3. To identify the Interest of Adolescent in the use of technology as a tool for counseling
4. To identify Interest among Stakeholders in Health and education in the technology as a tool for counseling.

1.6.3. Conceptual Framework (Analysis of the concept)

To ascertain the feasibility of the use of mobile technology as counseling tool for adolescent sexual reproductive issues, the researcher needed to look at four key aspects; mobile infrastructure availability by Telecommunication Operators (Telcos), cost implications (whether or not adolescent and their families could afford), whether or not the technology is especially, culturally acceptable and finally relevant government organizations willingness to support the initiative.

Figure 1.6.3: Conceptual Framework (Analysis of the concept)



1.7 Justification of the study

Mobile communication offers an operational means of conveying healthcare services to developing country citizens (WHO Report 2006). With low price handsets and the infiltration of mobile phone networks worldwide, tens of millions of people that never had regular access to a fixed-line telephone or computer now use mobile devices as daily apparatuses for communication and data transfer. A full 64% of all mobile phone users can now be found in the developing world. Additionally, approximations demonstrate that by 2012, half of all persons in far-flung areas of the world will have mobile phones. This

rising ubiquity of mobile phones is a central component in the promise of mobile technologies for health. This flare-up of mobile phone usage has the prospective to improve health service provision on a massive scale. For example, “mobile technology can support increasingly inclusive health systems by enabling health workers to provide realtime health information and diagnoses in rural and marginalized areas where health services are often scarce or absent altogether” (United Nations, 2007).

Mobile technology, a fast pacing sector, is conveying in a new prototype for communications and thus a new paradigm of society. The pillars for this new society are the adolescents, emphasizing the aspect of addressing adolescent’s health issues with the use of technology on a daily basis, and hoping for wholesome family health and thus society.

This study will therefore inform policy makers and stakeholders of the benefits that will be derived from the use of mobile technology in addressing health concerns of adolescents. The study will also contribute to existing literature on the use of mobile technology to address health concerns.

1.8 Scope of the study

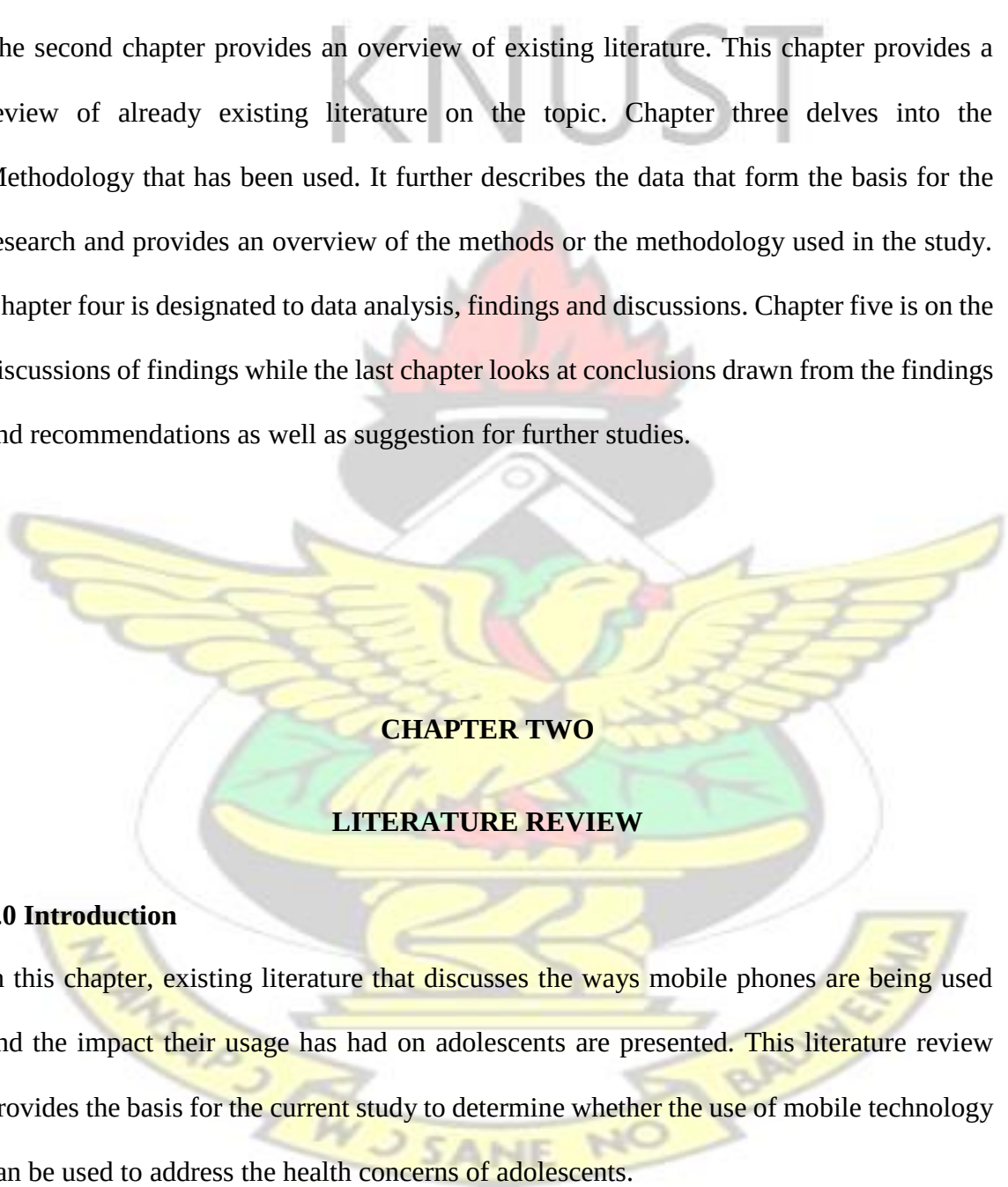
A combination of primary and secondary data was used for the study. Primary data was collected from respondents. The people in Amansie West District constituted the study population with adolescents aged 10-21 years being the target. The subjects were drawn from across the seven sub districts of study site taken into consideration teens.

Secondary data was taken from books, magazines, annual reports, print and electronic journals as well as the internet.

1.9 Organization of the study

The study is made up of six chapters. The first chapter deals with the Study Background, Problem Statement, Research hypothesis, significance of the Study, Study Objectives, Scope, Limitation as well as Chapter organization.

The second chapter provides an overview of existing literature. This chapter provides a review of already existing literature on the topic. Chapter three delves into the Methodology that has been used. It further describes the data that form the basis for the research and provides an overview of the methods or the methodology used in the study. Chapter four is designated to data analysis, findings and discussions. Chapter five is on the discussions of findings while the last chapter looks at conclusions drawn from the findings and recommendations as well as suggestion for further studies.



CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

In this chapter, existing literature that discusses the ways mobile phones are being used and the impact their usage has had on adolescents are presented. This literature review provides the basis for the current study to determine whether the use of mobile technology can be used to address the health concerns of adolescents.

2.1 Overview

2.1.1 Definition of Adolescents

According to Berk (2003) “Adolescence is a transitional period of physical and mental growth that develops between childhood and adulthood. The transition involves biological, social and psychological changes”. Historically, the definition of adolescence was solely based on age categorization; however, Tyyska (2005) suggests that defining adolescence is a fluid process in terms of categorization. Demonstrating this fluidity, the United Nations (UNICEF, 2001) defines youth as young people between 15- and 24-years old, teens as those between 15- and 19-years old, and young adults as those between 20- and 24-years old.

Internationally, the definition of youth and adolescent growth is embedded in cultural expressions, historical interpretations, and religious and economic factors.

In non-western countries in the Southern hemisphere, adolescence is defined by specific cultural traditions that force adolescents to take on leadership or adulthood roles at a very young age.

The definition of adolescence has also varied with the passage of time. Adolescence not only refers to the transition age for youth, as demonstrated by physical and anatomical measurements, but also includes the creation of new roles, identities, and psychosocial values in a particular culture or region. In many cultures, adolescents, either individually or in groups, seek their own paths to define their own process of transformation into adulthood.

The United Nations Population Fund Agency (UNFPA) defines adolescents as those who fall between the ages of 10 and 19 years and classifies the youth as aged 10-24 years. However some psychologists describe adolescence as the period of transition from childhood to adulthood, starting from around 10-12 years old, up to 18-21 years old.

2.1.2 Definition of mHealth

Michael (2009) defines mHealth as the use of mobile technologies to improve the way health professionals deliver health-connected services to the general public and enhance an individual's access to healthcare services. According to WHO (2011), the term mHealth is defined by the Global Observatory for eHealth (GOe) as “medical and public health practices supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices”.

2.1.3 Defining mHealth within the context of eHealth

Recently, mHealth has emerged as an important sub-segment of the field of electronic health (eHealth) (www.unfoundation.org). While there is no widely agreed-to the definition for these fields, the public health community has merged these working definitions:

eHealth: Using information and communication technology (ICT) such as computers, mobile phones, and satellite communications for health services and information.

mHealth: Using mobile communications such as PDAs and mobile phones for health services and information.

mHealth and eHealth are inextricably linked both are used to improve health outcomes and their technologies work in conjunction. For example, “many eHealth initiatives involve digitalizing patient records and creating an electronic ‘backbone’ that ideally will standardize access to patient data within a national system. mHealth programs can serve as the access point for entering patient data into national health information systems, and as remote information tools that provide information to healthcare clinics, home providers, and health workers in the field. While there are many stand-alone mHealth programs, it is

important to note the opportunity mHealth presents for strengthening broader eHealth initiatives” (www.unfoundation.org)

2.2 Healthcare and mHealth in low and middle-income countries

Many “Middle income and particularly low-income countries face overabundance of restrictions in their healthcare systems. These countries face a severe lack of human and physical resources, as well as some of the largest burdens of disease, extreme poverty, and large population growth rates. Additionally, healthcare access to all reaches of society is generally low in these countries” (<http://en.wikipedia.org/wiki/MHealth>).

According to a World Health Organization (WHO) report from June 2011, “higher-income countries show more mHealth activity than lower-income countries (as consistent with eHealth trends in general). Countries in the European Region are currently the most active and those in the African Region the least active. The WHO report findings also included that mHealth is most easily incorporated into processes and services that historically use voice communication through conventional telephone networks” (WHO Report, 2011).

The report was the result of a mHealth survey module designed by researchers at the Earth Institute's Center for Global Health and Economic Development, Columbia University (WHO 2011 Report).

The WHO notes a “great shortfall within the global healthcare workforce. The WHO notes critical healthcare workforce shortages in 57 countries most of which are characterized as developing countries and a global shortage of 2.4 million doctors, nurses, and midwives. The WHO, in a study of the healthcare workforce in 12 countries of Africa, finds an average density of physicians, nurses and midwives per 1000 population of 0.64. The density of the same metric is four times as high in the United States, at 2.6” (<http://en.wikipedia.org/wiki/MHealth>).

The burden of disease is also “much higher in low and middle income countries than high income countries. The burden of disease, measured in disability-adjusted life year (DALY), which can be thought of as a measurement of the gap between current health status and an ideal situation where everyone lives into old age, free of disease and disability, is about five times higher in Africa than in high-income countries. In addition, low and middle income countries are forced to face the burdens of both extreme poverty and the growing incidence of chronic diseases, such as diabetes and heart disease, an effect of new-found (relative) material comfort”(http://en.wikipedia.org/wiki/MHealth). Considering poor set-up and low human resources, the WHO notes that “the healthcare workforce in sub-Saharan Africa would need to be scaled up by as much as 140% to attain international health development targets such as those in the Millennium Declaration. The WHO, in reference to the healthcare condition in sub-Saharan Africa, states: The problem is so serious that in many instances there is simply not enough human capacity even to absorb, deploy and efficiently use the substantial additional funds that are considered necessary to improve health in these countries. Mobile technology has made a recent and rapid appearance into low- and middle-income nations. While, in the mHealth field, mobile technology typically refers to mobile phone technology, the entrance of other technologies into these nations to facilitate healthcare are also discussed here” (http://en.wikipedia.org/wiki/MHealth).

Studies in most part of the world have proven that mobile technology has greater opportunity to improve the quality of healthcare delivery, curtailing delays and reducing unnecessary transportation in seeking health and even reduce cost of healthcare financing. Specifically mobile technology has facilitated and improved adolescent and youth healthrelated programs in most part of the world even though this is a recent technology.

In Nigeria the survey found that 76% of users were satisfied that their question had been answered properly, and many had returned to use the service again. Of the 24% of respondents who were not satisfied, more than 50% had not received a reply due to network fluctuations (Armstrong, 2012).

2.3 Theoretical framework

Several theoretical frameworks such as Self-Directed, Socio-Cultural theories of Learning, Technology-Mediated Learning (TML) and Activity Theory (AT) have been used to guide investigation in technology education and development.

Chinnery (2006) used the concept of TML to examine how technological devices are employed to assist learning. Whereas these frameworks are useful for understanding the connection between technology and literacy, most of them are employed as methodologies, rather than theoretical frameworks. Emergent tools that afford literacies in science education involve work with theories that adequately and critically combine elements such as tools with objects, subjects, and communities to promote literacy.

Activity theory is among these theories.

According to Sam (2012), the distinction between AT and other theories is its unit of analysis as an activity. Activity Theory was selected over other theories because this study is not solely to empower individuals as depicted in Critical Theory (CT). Rather, since the study aims to investigate how best individuals and healthcare personnel can employ mobile phones to access useful health information and also perform health-related activities to promote, maintain, and improve healthy living. Hence, adapting a framework that allows individuals to discover for themselves what their health issues are, and various ways of dealing with the health issues, AT was the appropriate choice.

Experiential Learning Theory

Miller and Boud (1996) define experience as the totality of ways in which humans sense the world and make sense of what they perceive. The value of experience as a tool in the creation of knowledge and the promotion of human development, according to Aristotle (n.d.), is a theory that is not understood as possessed knowledge until learners prove that they are able to apply that knowledge in their lives. Hutton (1989) adds that once learners identify the kind of knowledge they need, the next level to look out for is how such learning can be achieved.

However, this study is not generally about adult learning. It is about using tools (mobile phones) to perform health-related activities.

Self-Directed Theory (SDL)

According to Boud (1991) “the ultimate purpose of education is the betterment of society” In this theory, individuals are considered to be responsible owners and managers of their own learning content and process. According to Gibbons (2002), SDL is any increase in knowledge, skill, accomplishment, or personal development that individuals may select to bring about their own efforts, using any method in any circumstance at any time. The theory involves the learner initiating learning, making the decisions about it to reinforce the learning. As a result, SDL has been identified by researchers as an approach to learning, where learners are responsible for what they learn and the decision to be self-directed and selective in their own learning (Smedley, 2007). Thus, SDL is somehow helpful at studying informal learning activities with mobile phones. This study is not centrally about learning with phones. It is about using a digital device in information seeking behaviours among adults. Hence, SDL is limited as a theoretical tool.

Critical theory (CT)

Critical theory (CT) is “a reflective theory which gives agents a kind of knowledge inherently productive of enlightenment and emancipation” (Geuss, 1981).

The theory focuses on political, cultural, economic, and social relationships within a culture, particularly as they are related to what groups of individuals have power and which groups do not have power? The theory is more on interpretation and explanation, rather than social transformation (Perry, 2002) in terms of how individuals may have access to information in order to address their needs. Although CT helps to empower the powerless and transform social inequities and injustice by applying brakes on moves made by the powerful and inhumane to distort human life (McLean, 2008), it views information technology (IT) as another means of production. Mobile phones can either be employed as emancipatory tools or as tools of destruction, depending on the individual’s motives and on prevailing environmental conditions.

Socio-cultural theory

Socio-cultural theory is one of the theories that emerged from Vygotsky’s work. The theory has three central conceptual aspects that have contributed to the understanding of human interactions as social phenomena. These conceptual aspects are: (a) genetic analysis; (b) social learning; and (c) mediation (Wertsch, 1991). Socio-cultural theory is at its heart an interpretation that higher-order human functions, such as learning and, obtaining and seeking information, grow out of social interaction (Rogers, 2002). The theory has been employed in several educational research in literacy such as educational research in digital literacy (Gee, 2009) and educational research in technology (Kirkup, Gill, Kirkwood & Adrian, 2005; Peer & McClendon, 2002). Socio-cultural approaches and activity have in common the concept of mediation. Whereas socio-cultural theory

focuses on how social interactions and cultural factors influence and are influenced by mediate human action, activity theory focuses on how physical tools mediate human activity. In terms of differences, for instance, Wertsch (1991) observes that socio-cultural theories focus on action rather than activity. Sannino et al (2009) further explain the difference between sociocultural theory and activity theory “as a unit of analysis, the focus on action [by socio theorist] does not account for the historical continuity and longevity of human life”

Activity theory

Activity theory, according to Engeström (2009), is “a theory of object-driven activity”. According to Nardi (2002), AT is a powerful and descriptive tool that aims at interacting with an object in the world. AT originated from Vygotsky (1978) in the 1920s and early 1930s psychological research, “School of Russian Cultural History, “and developed in Russia with Leont’ev (1981), and others in the early twentieth century.

In addition to Vygotsky’s work on the socio-cultural aspect of learning, his work also focuses on how an individual’s actions are usually mediated by one or more instruments or tools (Bannon & Bodker, 1991). In accordance with Kaptelinin, Kuutti, and Bannon (1995), there is a rising interest in the AT tradition in Human computer-interaction (HCI) studies being done in Scandinavian countries, Europe, the United States, Canada, Australia, and Russia. Hayes et al (2005) state that all aspects of activity are shaped over time by individuals’ social interactions with each other and with the tools they use.

According to Sannino, Daniels, and Gutierrez (2009), from an AT perspective, “human life is fundamentally rooted in participation in human activities that are oriented towards objects”. According to Engeström (2009), the development of AT may be viewed from

three generations based on the types of activities specified by knowledge, tools, and number of tasks people use to achieve particular outcomes (Engeström, 2001; Uden, 2008). The first-generation approach to AT is based on Vygotsky's concept of mediation, which focuses on Vygotsky's triangular model, whereby an individual's actions are mediated by tools/artifacts. The limitation of the first generation, to Engeström (2009), is that the unit of analysis remains individually focused, and the process is linear. This limitation was overcome by the second generation, which was "built on Leont'ev's notion of activity system" (p. 307). Based on Leont'ev's (1978) work, the study of artifacts is integral and inseparable from components of human functioning. Engeström argues that the focus of the study of mediation should be on its relationship with the other components of an activity system. Engeström further combines the first and second generations to form the third generation. The third generation then becomes the unit of analysis for "reflective appropriation of advanced models and tools" that results in new activity systems (Cole & Engeström, 1993). Hence, the third-generation approach centres on the development of conceptual tools to understand multiple perspectives and networks of interacting systems (Engeström, 1999).

Engeström is a member of the third-generation activity theorists, and one of the outstanding representatives of the multivoicedness approach among activity theorists.

AT embraces the concept of mediation. Thus, human activity is mediated by artifact (Bannon & Bødker, 1991). Artifacts, according to Nardi (1991), are mediators of human thought and behaviour, instruments, signs, language, and machines. Artifacts, which include mobile phones and laptops, may provide individuals and healthcare personnel the possibility of using voice calls and textual and multimedia content to access and deliver information, since they are directly used in production in line with the tripartite division proposed by Wartofsky (1979). Nardi (1991) adds that these artifacts do not occupy the same ontological space, as they are created by humans to control their own behaviour.

Rather, artifacts serve as channels and forms from which individuals could obtain needed information and ideas to solve their problems. The theory casts the relationship between people and the tools as one of the mediations. This makes the activity system fully integrated to become a whole when using it to analyze and solve an individual's problems (Engeström, Miettinen, & Punamäki, 1999).

AT has tenets and principles. The tenets of AT are human intentionality, intermediates between humans and things, the idea of culture and society, and the interaction between agents and their environments (Bannon, 1986). These tenets explain why tools shape the way human beings interact. According to Engeström (1987), the theory is not simply concerned with doing activities for the sake of it. It is concerned with doing the activities in order to transform something, with the focus on the contextualized activity of the system. Technologies are both designed and used in the context of people with intentions and desires. From this theory, contexts in this study are neither containers nor situationally created experiential spaces. Rather, they are systems that integrate the subject, object, and instruments/tools to form a unified whole (Engeström, 1996; Engeström, 1987; Kuutti, 1996).

According to Engeström (2009), objects do not emerge nor exist without human activities. Hence, human beings need to identify and name them appropriately. As a result, the effects of runaway objects can remain dormant, invisible, or unseen for long periods of time until they come out into the open in the form of acute crisis or breakthroughs. Human activities are driven and instigated by certain objects or problems individuals may face in life or at workplaces. As a result, Murphy and Rodriguez-Manzanares (2008) state that the lens of AT can provide insights into change in individuals' practices and motives into how their access to information and knowledge may be reformed when a new technological tool becomes part of the activities that they perform. The theory, therefore, allows exploring

the kind of health activities that individuals perform on their mobile devices, and challenges they encounter during this process.

The key components of AT are subject, object, and mediating tool, together with the unique feature of the object that motivates activity toward certain needs that people wish to achieve (Bannon & Bodker, 1991; Engeström, 2009; Kuutti, 1991; Leont'ev, 1978). Nardi (1991) explains that the subject represents individuals engaging in the activity, and the object symbolizes an issue or an idea that needs to be addressed by employing the tool (mobile phone in the case of this study) to perform a particular activity (calling, sending SMS, browsing the Internet) in a specific direction. de Feijter et al. (2011) add that rules dictate how the tool should be employed, community comprises various agencies and locations where the needed information may come from to solve the problem, and finally, division of labour describes the roles of the members of the community involved in the activity system.

Nardi notes that usually, in the constituent/component of an activity system, the subject remains fixed, whereas object, tool, and activity change dynamically, depending on individuals' conditions and needs. The mobile phone is a good example of a tool whose activities have changed dramatically since its inclusion in health, and continues to change, depending on conditions and needs.

Kaptelinin and Nardi (2006) note the usefulness of AT in the following ways: (a) the theory has the potential to discuss the depth of users and their needs, technologies and their possibilities; (b) the theory opens up avenues for discussion and properly understands both subject and object in terms of learning and developmental opportunities; (c) the theory focuses on the analysis of the particular, rather than formation of generalized claims and hypothesis—concentrates mainly on the practicality of everyday activities and life's situations. To add to Kaptelinin and Nardi, AT supports the concept that a subject's

relationship with the objective world is mediated by tools that can be used to accomplish activities in various ways. Engeström (1999), for example, states that activities that are implemented with the tools are open systems that adopt new elements and ideas from the outside of expansive transformations in activity systems.

Thus, engaging the mind and body through activity, reflection, and application increases the possibility of educating and addressing the needs of individuals. With the diverse features and applications on mobile phones, several activities may be easily performed. This theory provides an opportunity to focus on the potential and possibility of employing the device, for instance, to promote access to health information.

Linking the concept of mediation to this study, there is a high incidence of low health literacy and low access to information related to individuals' health due to lack of or limited health facilities, and a poor healthcare delivery system. Bearing in mind these challenges and the fact that mobile phones serve as great communication tools as audio, text, and visual, the device has the promise to mediate the problem coupled with low health literacy and limited health facilities among individuals living in rural communities in Ghana.

There are five basic principles of AT (Kaptelinin, 1995). These basic principles, according to Kaptelinin, constitute a general conceptual system, rather than a highly predictive theory. These basic principles include the hierarchical structure of activity, objectorientedness, internalization/externalization, tool mediation, hierarchical structure of activity, and development. Engeström (2001) also outlines these basic principles as follows: first, activity system comprising of tools (mobile phone), subjects (humans), and objects (health-related problems), which is the main unit of analysis; second, individuals' multiple perspectives, interests, and traditions, as members of an activity system, "carry their own diverse histories," and the system itself "carries multiple layers and strands of history engraved in its artifacts, rules, and conventions; third, the principle of historicity

argues that the history of activity systems helps individuals to comprehend their problems as well as their potentials to solve the dilemmas at hand; and, fourth, though contradictions can result in tensions, transformation in activity systems in terms of expansive learning that reconceptualizes the object and the motive of activity will help reduce the tension.

Engeström (2009) stated that “the societal relevance and impact of activity theory depend on our ability to grasp the changing characters of objects”. According to Engeström and Escalante (1996), when addressing individuals’ health issues, the object can manifest itself in various forms, and that may involve employing different activities with the tools to reach the objectives. In situations like this, a single activity may not be suitable in dealing with such problems. Engeström (2008) broadly defines these objects or needs as generators of foci of attention, effort, motivation, and meaning. He calls them runaway objects.

Runaway objects, according to Engeström (2009), refer to issues of concern that can only be identified by performing a set of activities. Runway objects have the potential to escalate and expand to a global scale of influence. They are objects that are rarely under anybody’s control and have far-reaching, unexpected effects. Most objects do not start out big and risky. The objects “begin as small problems, which makes their runaway potential difficult to predict and address”. Engeström (2009) outlines some fundamentals for runaway objects. These include: (i) the object should have the potential to “transcend the limits of the original utilitarian profit motive” (Engeström, 2009); (ii) the objects or problems stand at the “junction of legitimate and illegitimate, sensible and crazy, work and leisure, technology and art”; and, (iii) the objects should be visible, accessible, and easy to be returned to by humans in the near future.

Runaway objects can be placed into two perspectives; one, the objects are between concerns that generate attention, effort, and meaning; and two, the objects are powerful technological innovations, emancipatory objects that open up radically new possibilities

for development and well-being (Engeström, 2009). The objects can be small or large. Small runaway objects tend to have one activity system, whereas large runaway objects have numerous activity systems working on the object. Again, with small runaway objects, the boundaries of the object are hard to draw. As well, “the positions of the activity systems are big and ambiguous, which sometimes seem to be subsumed by the object rather than in control of it”. On the other hand, big runaway objects, according to Engeström, tend to be either what used to be viewed as natural forces or technological innovations. These objects, according to him, are usually seen as objects for comparatively exclusive professional expert activities. As a result, patients and users of the activity system become marginal or “rubbish” (Engeström & Blackler, 2005) when big runaway objects become exclusive professional expert activities. Therefore, the task of AT is to “recycle the rubbish and turn it into diamonds” (Engeström, 2009).

Connecting the concept of runaway objects with the study, AT as a theoretical tool illustrates how to recycle or turn mobile phones from just chatting with friends and family into a useful health information-seeking tool.

We see the components of AT in the activity system, as tools in the system represent mobile phones, subjects become individuals/participants, and objects represent healthrelated issues that need inquiry. Linking the tenets of AT, the theory seeks ways individuals use mobile phones as tools to obtain health assistance (e.g., from either community healthcare personnel or family members) in order to improve their health status. To Hashim and Jones (2007), the theory allows the most advantageous design of tools to support technology-mediated activities in various contexts such as health literacy, and develops methods to put them into practice. Within the activity theory framework, individuals are considered to employ the devices to carry out diverse activities, from voice calling to text reading. AT has not been employed much as a conceptual framework in the

study of mobile phones and access to health information. There is a gap in employing AT to study mobile phone activity. Other studies that employ AT and mobile phones focused only on the contribution of the theory as a theoretical framework (Tan & Melles, 2010), without carrying on empirical studies. Sharples (2005) used AT to study how technologies (e.g., mobile phones) can serve as a bridge between formal and experiential learning, whereas Madsen (2009) employed the theory to conceptualize the processes students undergo when accessing academic resources, such as the use of the school library and its challenges. Keddie (2007) also utilized activity theory in an action research to analyze what goes on in the context of the classroom when a new mathematics software package is introduced as the primary teaching tool. In a more recent research, Timmis (2014) applied the theory to discover various conceptual and methodological challenges in researching sustainable computer-supported collaborative learning (CSCL) within authentic educational settings.

All these studies focus on using mediating tools in learning. There is the need for a study that explores the potential use of mobile phones to promote health literacy and access health information among informal learning and literacy settings such as in rural communities.

In terms of how individuals may view their health experiences, possession of the device and other health information-related challenges are basic to seeking and using relevant health information in a self-directed environment. As such, mobile phones are regarded by most researchers as tools with the potential to promote an individual's access to health information. Commenting on the high interest of usage of mobile technology devices for learning and health, Wan (2009) state that comprehensive theoretical framework on relevant constructs for studying mobile learning and their relationships has yet to emerge. The core premise of AT is that activities are object oriented, which distinguishes it from

other theories such as socio-cultural theory, which focuses on actions and social interaction, rather than activity (Wertsch, 1991). AT focuses on the interconnections of people, organizations, rules and culture, and tools, all directed to the same goal (Bertelsen & Bodker, 2003; Cole & Engeström, 1993). Relating the basic principles of AT, these are some of the questions into which the theory helps to inquire: What happens in the lives of individuals when they obtain needed health information? Is the health information really helpful to address the health problem? Was the device capable of assisting individuals to access the needed information?

Connecting the principles of AT with runaway objects, for instance, individuals may be having problems with diseases and illnesses, such as malaria, cholera, typhoid, or pneumonia, that need attention. Other runaway objects could be health-related issues, such as maternal and antenatal issues, and family planning. With runaway objects, people, however, identify the kind of activities that can be performed on them and, possibly, give names to the activities based on objects and needs. For instance, cholera and typhoid outbreaks may not become a health issue if individuals keep their surroundings and eating areas clean. Hence, individuals identify what the problems are and the best way to control them by practicing personal and environmental cleanliness.

Klein (2007) adds that current capitalism, disasters, and unexplained illness are becoming dormant runaway objects of concern. For instance, the effects of low health literacy and limited access to relevant health information may remain hidden for a long period of time, especially in rural communities where there is limited access to medical facilities and healthcare personnel. Individuals' low access to relevant health information may cause outbreaks of illnesses and diseases such as *E. coli*. AT considers technological devices as innovative tools that have the potential to "transcend the limits of the original utilitarian profit motive" (Engeström 2009) of the designer of and subscriber to the tool.

Technological innovation considers mobile phones as one of the powerful tools for supplementing healthcare delivery service, which when used properly, can reveal the objects (health problems) and promote healthy living (Nutbeam, 2006). Diseases and illnesses such as malaria, sexually transmitted diseases (HIV/AIDS, syphilis, and gonorrhea), and cholera (object) are considered to be a result of low health literacy and limited access to health information.

Considering that, by its very nature, access to relevant information has social constructivist characteristics in terms of individual needs and difference (Hayes et al., 2007), mobile phones enable individuals to take centre stage in seeking, evaluating, and using health information to address several health issues. AT provides a broad theoretical framework for describing the structure, development, and context of human activity, and proper implementation of technological devices in relations to goals, plans, and values of the user or in the context of development (Uden & Willis, 2001). This permits the researcher to comfortably ask descriptive questions, such as: (a) how individuals employ the device in the health settings; and (b) instances where individuals find it difficult employing the device to perform any form of health activities.

In conclusion, Theories examined so far in this chapter is in a way related to this study in one way or another; however, literature reviewed tends to suggest AT (Engeström, 2008) as a more appropriate framework. Hence, this study considers AT to adequately explore the use of mobile phones to address health concerns of adolescents. Moreover, AT is more descriptive than predictive. It also focuses on the activity afforded by a technological tool.

2.4 mHealth and health outcomes

The mHealth field operates on the premise that technology integration within the health sector has the great potential to promote a better health communication to achieve healthy

lifestyles, improve decision-making by health professionals (and patients) and enhance healthcare quality by improving access to medical and health information and facilitating instantaneous communication in places where this was not previously possible (<http://en.wikipedia.org/wiki/MHealth>).

It follows that the increased use of technology can help reduce health care costs by improving efficiencies in the health care system and promoting prevention through behavior change communication (BCC). The mHealth field also houses the idea that there exists a powerful potential to advance clinical care and public health services by facilitating health professional practice and communication and reducing health disparities through the use of mobile technology (WHO Report, 2008).

The growth of health-related applications (Apps) and the availability of mobile device drive the growth of mHealth. In 2010, only about 4,000 health-related apps were available, and now more than 20,000 health-related apps are available for mobile device. It has been predicted that revenues from remote patient monitoring services that use mobile networks will rise to \$1.9 billion globally by 2014, according to Juniper Research's recent report in 2011 (<http://en.wikipedia.org/wiki/MHealth>).

It has been identified that efforts are ongoing to explore how a broad range of technologies, and most recently mHealth technologies, can improve such health outcomes as well as generate cost savings within the health systems of low- and middle-income countries. In some ways, the potential of mHealth lies in its ability to offer opportunities for direct voice communication (of particular value in areas of poor literacy rates and limited local language-enable phones) and information transfer capabilities that previous technologies did not have. Overall, mobile communication technologies are tools that can be leveraged to support existing workflows within the health sector and between the health sector and the general public. (<http://en.wikipedia.org/wiki/Mhealth>).

Within the mHealth space, projects operate with a variety of objectives, as stated by the UN Foundation and Vodafone Foundation's report on *mHealth for Development*:

- increased access to healthcare and health-related information (particularly for hard-to-reach populations)
- improved ability to diagnose and track diseases
- timelier, more actionable public health information expanded access to ongoing medical education and training for health workers.

2.5 Mobile for Adolescent Sexual and Reproductive Health

Adolescents have profound sexual and reproductive health problems including gender inequality, sexual coercion, early marriage, polygamy, female genital mutilation, unplanned pregnancies, closely spaced pregnancies, abortion, sexually transmitted infections (STIs) including HIV/AIDS. Lack of proper information and communication are the most important factors that exacerbate and perpetuate adolescents' health problems (<https://novoed.com/mhealth/reports/52139>).

Adolescents are also becoming the leading subscribers of mobile phones and users of computers mainly for social networking (<https://novoed.com/mhealth/reports/52139>). The explosions of electronic technologies like the availability of internet either at home or school and the wide use of mobile phones are new opportunities to provide sexual health communication to adolescents (www.unfpa.org).

Adolescents prefer sexual health information to be easily accessible, trustworthy, credible, confidential and non-threatening (<https://novoed.com/mhealth/reports>).

Adolescents constitute a large segment of the population in all countries. It is a period of risk taking and reward seeking, strongly influenced by the environment as well as individual factors. This results in a vulnerability to sexual and reproductive health

problems due to lack of access to age appropriate accurate health information. Simultaneously new neuroscience research in this age group tells us that the development of the brain is far from complete and that the environment and individual factors work together to mold decision making in the youth. Youth across the world are also increasingly using technologies including telecom and internet services for social networking, communication and information gathering; making this a potentially powerful technology to use to support education as well as positive decision making for adolescents (<https://novoed.com/mhealth>).

2.6 Various means of employing mobile phones to perform health associated activities

Mechael et al. (2010) admit that the use of mobile phones to perform activities related to health is transforming many lives across the world in general and, specifically, many lowincome communities. Mechael (2009) and Greenspun and Coughlin (2013) express that the ubiquity of mobile phones and allied technologies, as well as their related features, harness the ability to communicate and transfer information, specifically health information, within both “literate” and “illiterate” populations. These communication activities range from organizing emergency support to scheduling a doctor’s appointment, to remotely monitoring diabetes and other chronic conditions that may not need intense care from physicians, especially in developing countries. mHealth Ethiopia Report (2011) adds that medical and health practices also perform activities ranging from the use of simple mobile phone based applications to transfer of health information on mobile phone via SMS, to highly sophisticated diagnostic applications that rely on advanced equipment and robust backend data systems. This process tends to reduce health challenges confronting many individuals, such as cost of transportation to obtain health information

and shortages in medications (WHO, 2011). mHealth Ethiopia (2011) adds, for example, that the service of using mobile phones to communicate with healthcare personnel and other healthcare delivery agencies has the potential to greatly address health and other associated issues faced by most individuals, and improve the efficiency of communication between patient and healthcare workers, thereby reducing life-threatening delays in the delivery of care and extending the reach of the health system to underserved communities. According to WHO (2011), use of Mobile Doctors Network (MDNet), where medical personnel are able to communicate with each other in relation to managing a patient's health, has improved healthcare services, thereby reducing the number of patient deaths. WHO adds that implementation of MDNet facilitates the referral of patients to higher levels of care, especially in the rural communities. In addition, healthcare workers record information or convey bio-monitoring data from an individual to data storehouses or to their healthcare provider (Bezold et al., 2006). Chetley (2006) and Moore and Bloch (2009) explained that with health activities such as remote diagnosis and treatment, telemedicine could involve patients and health personnel, especially in hard-to-reach locations. mHealth Ethiopia (2011) and Bezold et al. add that, while mobile phones by themselves may not reduce health disparities and related illnesses, the devices and mHealth services offer better management of disease by patients and their doctors. As said by Gerber (2009), currently, mHealth applications and related activities being performed at both individual and healthcare levels serve as a way of improving health service delivery and access to health information in most communities. These applications, according to Vital Wave Consulting (2009), could be either curative or preventive measures of health and diseases.

When needed, medical health practitioners are able to access patient records, laboratory results, and provide remote diagnosis and referral, without being physically present with patients. In the same way, most parents would call the hospital to find out whether a doctor

is available to treat their children before commuting for several kilometers (Kalil, 2010). Other health activities in Africa include obtaining up-to-date lists of drugs, and information on a disease, with the help of Java-enabled mobile phones (Ofosu, 2009). In addition, Vodafone's (a mobile phone service provider) (2006) research study on mobile phone usage ascertained that features on the devices can be employed by young people to access confidential health-related information.

Selanikio (2002) notes that in medicine, medical professionals have installed software called EpiSurveyor on mobile phones to gather information about individuals and disease outbreaks in a community-based clinic. Anta, El-Wahab, and Giuffrida (2009) add that the device may also be employed to: (i) collect field data; (ii) alert doctors about any health emergencies; (iii) serve as a public health information gateway from patients to doctors and vice versa; (iv) send email reminders for checking blood pressure at home to patients with diabetes (Masucci, 2006); (v) access patient records and raising health awareness through dissemination of health tips by SMS; (vi) provide health information on patients; and (vii) generally, facilitate public discourse. Lu, Xiao, Sears, and Jacko (2005) observe that these activities are mainly performed by medical personnel.

In connection with mHealth, WHO (2011) reveals that a global eHealth survey conducted in 112 member states, including Africa, aimed to explore: (a) the existence and maturity of mHealth activities within member states; (b) types of mHealth initiatives being conducted; (c) status of monitoring and evaluation of mHealth initiatives; and (d) barriers to its implementation. The survey indicated that most mHealth initiatives performed by individuals include calling health centers, calling emergency toll-free telephone services, and calling for help during emergencies. However, there were fewer initiatives/activities on awareness raising, downloading health information onto the mobile device, and decision support systems.

WHO noted that although such activities tend to improve healthcare service delivery, the results differ from the reports in the literature that support the use of mobile devices for data collection and disease surveillance. Further, results from the survey, according to WHO, indicate that mHealth activities such as emergency toll-free telephone services and creating health awareness are performed less in Africa. The low practice may be due to insufficient infrastructure to respond efficiently and promptly to emergency health calls. In addition, Cotten and Gupta (2004), Kreps (2005), and Kukafka et al. (2003) supplement that despite the increase in the device's adoption, with its fanciful features and applications across the globe, in health, such patronage seems slow in Africa, particularly in those most vulnerable and geographically hard-to-reach locations.

Michael (2009) notes that with the demand on medical practitioners in developing communities, mHealth is considered to be a gateway to balance doctors and healthcare workers' responsibilities through telemedicine and teleconsultation. In congruence, Chetley (2006), Moore and Bloch (2009) express that for health activities such as remote diagnosis and treatment, telemedicine could involve patients and health personnel, especially in hard-to-reach locations. This form of health service is a way of building equivalence between health services delivered using in-person methods and health services delivered using telehealth methods (Glassman & Helgeson, 2012). In addition, telemedicine and teleconsultation allow patients to change the time, location, mode of receiving health care, and above all, communication gaps between clients and healthcare workers may be bridged. Delivery of health care, using these digital communication technologies, according to Centers for Medicare and Medicaid Services (2012), is perceived by both individuals and by government as a cost-effective alternative to the more traditional face-to-face way of providing medical care. Thus, the service has the ability to provide earlier diagnostic and preventive services. It also saves transportation and other

associated costs. As a result, most countries have created health call centers, known as health hotline, to respond to patients' inquiries, providing medical advice and information over the telephone to individuals, in the form of voice calls (West, 2012). To make the process and service more effective and reliable to patients, according to Moore and Bloch (2009), software with built-in protocols are built to guide call agents through a series of questions to respond to clients' common illnesses and diseases.

Moreover, primary healthcare workers utilize mobile phones to seek advice from healthcare experts in order to refer patients to the appropriate specialists when needed. According to Moore and Bloch (2006), when healthcare personnel at the triage are provided with the right information, they are able to make informed decisions and diagnoses about patients' and provide patients with a better understanding of their conditions. In addition to audio and verbal communications between patients and healthcare workers, other applications of telehealth, according to Centers for Medicare and Medicaid Services, include videoconferencing between a patient and healthcare provider for consultation. Other activities comprise transmission of data, such as X-rays, photographs, remote monitoring of vital signs, video captions of patients and other health indicators to health practitioners for disease management. A study conducted by Lazev et al (2004) to explore the possibility of using cellular telephones to improve access to smoking cessation counselling in a low-income and HIV-positive population revealed positive results. Thus, the use of the device in these locations provided for prompt treatment of illness, flexibility and convenience, confidentiality, and the ability to provide counselling in real-time situations.

In addition to impact and benefits of using mobile phones, the device has recently become a web-accessing tool, and is used for other educational and business activities such as literacy (Attewell, 2005) and banking (Herzberg, 2003). Presnky (2004), an expert in

digital technology, notes that features such as text messaging on mobile phones can be used in education to facilitate the learning process. Ofosu (2010) adds that the mobile phone is not only benefitting education, but also health, especially mHealth. For instance, Ogilvie (2010) notes that in the Toronto public health sector mobile phones are used to create awareness among youth about sexually transmitted diseases. Andreatta et al (2011) nonetheless state that in health, studies on the device's usage mostly focus on medical practitioners employing the device to collect data from patients, with less emphasis on how individuals themselves may use the device to promote their health by seeking, evaluating, and utilizing health information.

Although there is no doubt that there is a significant growth in technological devices in healthcare delivery, Glassman and Helgeson (2012) argue that in general, spreading of mHealth as a mode of healthcare delivery appears to be slower than expected, given the high spread of mobile phones. The slowness is a result of multiple barriers discovered by telehealth report to its wider exploitation. This involves confusing definitions of telehealth, uncertainty of payment for services, challenge of integrating technology among providers, lack of training resources, and privacy and protection of patient information. Similarly, the United Nations (2008) states that, the challenge with slow spread of the service lies with the tools' availability in most developing countries. In that sense, tools to gather reliable data in order to make a diagnostic decision on a patient's health are either too expensive to purchase, unsupportable, or inaccessible to train healthcare workers to provide the necessary care to patients (Pakenham-Walsh & Bukachi, 2009).

Further, mHealth services and mobile phones are not utilized by the majority of patients and other individuals due to limited education on how the service operates (Masucci, 2006). The low patronage may also be attributed to the fact that less attention has been paid to how the devices may be employed by individuals to obtain independent health

information. Hence, to realize the device's potentials, and maximize its opportunities to promote equitable access to health information and other health-related activities, it is imperative for individuals to be educated on the device's usage, as well as potential outcomes of the services.

With all these controversies with regard to low patronage of the device for health related activities, Mechael (2009) argues that people use the device for health-related activities casually, and that makes it hard to recognize and determine its benefits. Stilwell (2001) notes low adoption of health-information technology in the health sector as another issue confronting effective healthcare delivery, especially in rural areas. A report from Daar et al (2002) indicates that many diagnostic techniques, such as laboratory tests for infectious agents, and imaging techniques—radiology and ultrasound examination—currently in use in developing countries, are burdensome and unsuitable for use in low-resource settings. This is due to low financial margins to support diagnostic techniques or lack of funds to purchase, maintain, and upgrade the diagnostic equipment (Sheps, 2006). The Institute for Alternative Futures (as cited in NORC at the University of Chicago, 2010) summarizes that:

The use of mobile/smart phone applications to transmit health-related information, monitor disease, and directly communicate with providers is viewed as a potentially beneficial mechanism for improving the quality of health and management of chronic disease. Similar to health kiosks, mobile phone health applications are viewed as potentially effective for reaching low-income minority populations who are more likely to have access to mobile phones than to the Internet. Diseases and illnesses such as diabetes may be monitored remotely by the use of mobile phone to communicate between patients and healthcare personnel.

2.7 Barriers to the use of mobile phones in mHealth implementation

According to NORC at the University of Chicago (2010), there has been a substantial amount of documentation regarding general barriers to adoption and implementation of health information technology. Additionally, access to modern communication technologies and medical assistance is a challenge for the majority of people living in developing countries, especially in rural communities (Clifford et al., 2008).

Haddon and Vincent (2007) note the cost of phone service as the biggest challenge for individuals, especially among youth, to employ the device for any form of activities. There are several daunting challenges with regard to the use of mobile phones in health-related activities. According to Mechael (2006), in Egypt, these factors include: (a) cost; (b) perceptions of risk; (c) reliability of telephone systems in health facilities; (d) safety, liability, and cost recovery for unknown contacts as well as information and services provided at a distance; (e) lack of understanding and use of a range of functions available through mobile phones; and (f) poor quality of health services. A systematic literature review conducted by Déglise, Suggs, and Odermatt (2012) on the use of the SMS feature for disease prevention in developing countries such as India, Kenya, and South Africa, identified primary barriers to include language, timing of messages, mobile network fluctuations, lack of financial incentives, and data privacy. These deep-rooted factors and the daunting challenges involved in employing the device to perform health related activities are frequently noted by individuals living in the rural areas (Odutola, 2003).

In addition to the above challenges, other controlling factors include a person's age, gender, level of education, individual innovativeness (National Research Council, 2011), the community's cultural practices (van Biljon & Kotzé, 2008), and the nature of information content sought (Chetley et al., 2006). These factors, according to van Biljon and Kotzé, are termed as social constructs.

Rashotte (2006) defines a social construct as a “change in an individual’s thoughts, feelings, attitudes, or behaviours that results from interaction with another individual or a group”.

On the other hand, the influence includes: (i) an individual’s cultural practices and interests, such as beliefs about using mobile phones to obtain relevant information about health as a way of promoting a healthy lifestyle (Gerber et al., 2009; Green & Potvin, 2002; Nutbeam, 2000); (ii) an individual’s demographic information and the type of health information to access on the mobile phone; (iii) an individual’s security and privacy of information.

In general, mobile phone usage, according to van Biljon and Kotzé (2008), involves “the mobile phone, the telecommunications system, the mobile phone users, the adoption, and the use of the system”. Kalil (2010) observes that the mobile phone, akin to any new technology, has costs and risks as well as benefits, yet many of these benefits would certainly fail to happen due to several factors. This notion of underlying challenges with the device’s usage in mHealth is an aspect of this inquiry in this study.

The National Research Council (2011) and Ouma, Herselman, and VanGrauen (2011), are of the view that “several factors combine to influence the delivery of m-Health services within communities in particular. In most cases, these elements do not operate in isolation; rather, a combination of two or more, many of which are uncontrolled elements such as demographic, environmental, and socio-economic status”. The challenges/factors are categorized under three main clusters:

1. Socio-economic and demographic factors including: (a) age; (b) level of education; and (c) income

2. Technological features and service impacts including: (a) affordability of mobile devices and service; (b) mobile network systems; (c) the device's screen size; and (d) availability of information
3. Cultural beliefs and practices about health including: (a) individuals' beliefs about health care in general; and (b) beliefs about access to health information

2.7.1 Socio-economic impacts on mHealth activities

According to Kwon and Chidambaram (2000), socioeconomic factors “are a major mediating factor that may have influence on the mobile phone's adoption for various activities including health”. Cline and Haynes (2001) sum these variations of access to health information on the basis of socio-economic factors and name this factor the digital divide. Socio-economic status affecting device usage includes variables akin to an individual's job status, level of education, and income of most people in the rural communities. In addition, Ojo (2006) states that “a high level of illiteracy, poverty, and absence of basic infrastructure prevents most people from adopting the device”.

2.7.2 Technological features and services on mHealth activities

It is believed that “for individuals to feel comfortable in using mobile phones to perform any form of activity, certain factors such as affordability, suitability, and dependability of the device should be in place” (Gerber et al., 2009; Rashid & Elder, 2009; van Biljon & Kotzé, 2008). Satellife (2005) identifies “connectivity, content, and capacity as major factors to the adoption of mobile devices. This subsection examines some technological factors that limit the usage of mobile phones for seeking and receiving health information”. According to Ghyasi and Kushchu (2004), some of the reasons for low use of mobile devices, especially in Ghana, to access health information include poor technology

infrastructure and low level of income of most people in the rural communities. Frempong, Essegbey, and Tetteh (2007) add that the initial costs for obtaining the device as well as ongoing service costs in terms of purchasing mobile phone credits influence an individual's usage. Michael (2006) agrees that the initial startup cost situates the device into the hands of a large number of individuals. When it comes to employing the device for health information and emergency-related benefits, however, household individuals could share their mobile phones with others.

One major barrier to the device's implementation is a reliable network system to access health information and transmit data from health personnel to patients and vice versa (Biljon & Kotzé, 2008; Jeng et al., 2004). The network is perceived to be about how useful and easy the device is to an individual in terms of its features and reliability (Biljon & Kotzé, 2008). For Chetley et al. (2006), the problem with connectivity involves access to electricity, solar power options, and network connectivity. Similarly, Ashraf et al (2005) observe that sometimes, an unreliable phone network makes it difficult to maintain or use the device, especially in rural and other medically underserved communities. Idowu et al (2008) assert that most traditionally hard-to-reach individuals are without an electrical power supply. Hence, it becomes hard to maintain the device.

Another technological barrier to the employment of mobile phones in mHealth is the screen size (DeHart & Heckerman, 2008; Jeng et al., 2004). The small screen and keypad pose challenges to most users, especially when medical personnel are entering voluminous data, such as a daily summary of patients who may need medical care, or a patient's diagnosis, onto the phone (DeHart & Heckerman, 2008). Above all, Sarasohn-Kahn (2010) expresses that most mobile health applications on the device are mostly designed for use by hospitals and physicians.

Besides technological barriers, the availability of the information itself and set-up of the information to be accessed pose another major challenge. Thus, an individual's tendency to discover knowledge and information, and adopt the information based on needs and interests may largely depend on availability and accessibility of the information. For example, an individual's ability to appreciate the usefulness of a mobile phone as a tool for disseminating and accessing information will be based on how reliable and easy he or she may locate and apply the information to his or her needs. Gyasi and Kushchu (2004) decry the fact that despite the high coverage of mobile phones, many are not adopting the device much for developmental purposes, especially in rural communities. This low interest is as a result of the lack of unreliable databases or centres where such health information may be accessed.

Moreover, when the contents of the information seem not to gear toward an individual's/community's needs, introduction and successful application of ICTs including mobile phones in the health sector, may be impeded (Chetley et al., 2006).

They further add that appropriate language is frequently neglected in ICT programs and little or no content is available in local languages. This makes it difficult for people to get involved in such programs, especially in areas where low level of literacy seems to be high. Meanwhile, the enactment of technological devices in healthcare delivery in developing countries, specifically rural communities in sub-Saharan Africa, of Ghana, are no exception, has been hampered by several factors. Bukachi and Pakenham-Walsh (2007) describe these factors as traditional obstacles. These include lack of resources, such as poor infrastructure and road network, and insufficient political commitment to and support for information accessed on the Web for health purposes. Malhotra and Galletta (1999) add another influencing factor known as individuals' attitudes toward technological usage. In other words, employing a mobile phone to execute an activity may largely depend on

personal preference and the importance of that activity to an individual. Parveen and Sulaiman (2008) note that adopting mobile phones to perform any form of activity, be it in a health or non-health capacity, may depend on the individual's acceptance of the devices as explorative and learning tools.

Chetley (2006) and Satellife (2005) explain acceptance to involve the type of activity or information that the device is capable of performing or accessing. For example, it is perceived that individuals stand a chance of using mobile phones to inquire about information pertaining to their health and other related information from healthcare centres, without necessarily travelling to the centre (Smith, 2011). Cockcroft (2009) and Ojo (2006) observe that, in addition to an individual's beliefs and interests, mobile phone adoption to access health information or perform any health related activity becomes more beneficial when an individual's cultural values and aspirations are considered.

Sometimes, an individual's preferences and beliefs about the benefit of the device, including relative advantage, needs, image, and trust, may allow him or her to employ the device to improve health literacy (Friction & Davies, 2008; van Biljon & Kotzé, 2008). This is clearly experienced in communities where cultural beliefs influence access to health care and health information, especially among women living in the rural communities (Kyomuhendo, 2003).

The use of a mobile phone for health-related activities is influenced by several factors. Certain factors, including technological features, socio-economic and cultural practices may hinder use of the device to perform health activities. Technological factors which hinder these activities include poor technology infrastructure, small screen size of the device, unreliable networks by service providers, and the limited availability of a power supply to regularly charge the device. MHealth application designed for use by the public and that takes into consideration potential barriers would facilitate use for health activities.

2.7.3 Cultural practices, beliefs, and mHealth

As observed by Satcher (2010), most times, circumstances in which people are born, grow up, and live, as well as the kind of healthcare service delivery available to them, influence their readiness to employ a device such as a mobile phone for attending to health-related activities. Silverstone and Haddon (1996) indicate that such settings are typically influenced by factors such as cultural beliefs, social policies, and insufficient political commitment to and support of healthcare systems, especially in societies where nearly everything is controlled by political and traditional practices. According to Vaughn et al (2009), “cultural issues have increasingly become incorporated into medical care as there has been greater recognition of the intimate tie between cultural beliefs and health beliefs”. Vaughn et al. add that these related issues from culture have influenced most individuals’ perceptions of good and bad health and the causes of illness.

The impact of cultural beliefs and probably lack of medical personnel has caused most individuals to rely heavily on self-treatment or medication, on consulting traditional healers, or both (Young, 2001). According to Young, “not only are traditional healers and lay practitioners accessible and affordable, they are trusted members of the community who possess the ability to provide an explanation to illness and prescribe treatment in a cultural context”. Helman (2007) indicates that culture and traditional beliefs play a very significant role when it comes to health and health information-seeking behaviours. He further states that the practice may be greatly observed among individuals living in a nonWestern world. Thus, in populations where different cultural groups have diverse belief systems with regard to health in general, healing and access to health-related information may be achieved through the use of traditional and indigenous healthcare practices and approaches. DiMatteo, Haskard, and Williams (2007) suggest that making

health care and treatment of illness effective may involve approaches that would allow medical personnel to effectively understand, assess, and manage a patient's health by embracing the individual's language, culture, ethnicity, and social class into the treatment. Moreover, Vaughn, Farrah, and Baker (2009) contend that people of diverse cultural backgrounds often make different attributions of illness, health, disease, symptoms, and treatment. Similarly, Ghana, just like many Africa countries, is culturally diverse, and for that matter, the perceived attributions may only be said to be widespread.

Also, Helman (2007) notes that most individuals attribute causes of illness to several factors. These factors, according to Helman, include: (a) factors within individuals themselves (e.g., bad habits or negative emotional states); (b) factors within the natural environment (e.g., pollution and germs); (c) factors associated with others or the social world (e.g., interpersonal stress, medical facilities, and actions of others); and (d) supernatural factors including God, destiny, and indigenous beliefs such as witchcraft, sorcery, or voodoo. Global north residents tend to attribute the cause of illness to the individual or the natural world, whereas individuals from non-industrialized nations are more likely to explain illness as a result of social and supernatural causes. In congruence to Helman's, Chipfakacha (1994) adds that most Africans attribute illness to superstitious causes and therefore believe that disease is due to: (i) magic and evil spirits; and (ii) psychological phenomena.

A study conducted by Landrine and Klonoff in 1993 to compare causal attributions of illness found that supernatural beliefs are more important to African Americans, Latinos, and Pacific Islanders than White Americans. According to Landrine and Klonoff (1994), the study also reveals that African participants are more likely to attribute illness to "evil others," but all of the groups rated interpersonal stress as a potential source of illness. This is reflective of the reason most individuals do not seek medical help when they are sick.

Landrine and Klonoff note that although there are several methodologies and approaches to change an individual's perceptions about causal attribution to illness, these ethnic minority groups still hold onto their cultural and supernatural beliefs. Madge (1998) compares Western populations with non-Western populations like Africa and found that "patients in most African countries may be more likely to attribute illness to a spiritual or social cause, rather than a physiological or scientific cause. Thus, African patients are more likely to expect health practitioners to provide an experiential and a spiritual reason why they have been afflicted with illness". A study conducted by Mulatu in 1999 to examine lay Ethiopians in Africa for their causal beliefs about the perceived importance of various treatments for, and attitudes toward, mental and physical illnesses reveals that most Ethiopians largely attributed mental illness to cosmic or supernatural causes, including curses or spirit possession.

Consistent with the Public Health Agency of Canada (2011), an individual's health is determined by complex interactions between social and economic factors, the physical environment, and individual behaviour. Connecting all these challenges with an individual's use of mobile phones, Ouma (2011) states that there is a great deal of ongoing research on the device to perform health-related activities; few of these studies, however, focus on challenges that involve the adoption of the mobile phone in health sectors.

Cultural practice is believed to influence an individual's attitude toward seeking for health information in general. Most illnesses and diseases are attributed to various sources, depending on individual's location and beliefs.

2.8 Impact on mobile phone usage in mHealth

The Novartis Foundation and Millennium Villages Telemedicine Project, also known as Ghana Telemedicine Project (2012), focuses on employing mobile phones to improve the

quality of primary health services, particularly in rural areas. The project is in collaboration with the Ministry of Health (MOH) and the Ministry of Communications in Ghana. Other projects included: (a) the AAD Telemedicine Project, which employs mobile phones to electronically connect primary care physicians with dermatologists to assist with diagnoses; (b) Global Authentication Network (GAN) system for tracking counterfeit drugs; (c) Texting4Health, which involves the use of mobile phones to send health messages about health promotion and disease prevention as a way of creating the awareness of the ability to employ mobile phones in healthcare delivery services. MoTeCH (2012) is an open-source software project operated by the Grameen Foundation through funding from the Bill & Melinda Gates Foundation for mHealth applications. The program has interconnected mobile health services: Mobile Midwife and Nurses' Application. Mobile Midwife service is a program provided by MoTeCH Ghana, whereby mobile technology is employed to deliver automated voice or SMS health information messages containing time-specific information to pregnant women and nursing mothers. MoTeCH project was first piloted in Kassena-Nankana West district, located in the upper east region of Ghana. The project, according to Awoonor- Williams et al. (2012), involved:

“(a) the development and deployment of a Simplified Register, which centralizes the recording of health data in a significantly reduced number of books; (b) the development of a mobile phone-based health information system for health workers, which automates the production of monthly activity reports and provides alerts and reminders about possible defaulters; and (c) the implementation of a mobile phone-based health promotion module, which provides pregnant women and mothers of newborns with key information required to enhance the quality and frequency of patient provider interaction, as well as alerts and reminders of upcoming or missed care events”. Awoonor-Williams et al. stated that the aim of the project was to: (i) improve the quality of antenatal and neonatal care in districts,

thereby reducing the rate of childhood and maternal mortality in general in Ghana, and (ii) reduce the number of paper registers used, for a more efficient and faster reporting process at Community Health Compounds (CHCs). The program also aimed to improve health outcomes through recording and tracking of care delivered to women and newborns in their areas, using mobile phones with installed MoTeCH Java application.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter is designed to highlight on the research methodology used to achieve the stated objectives. These include: the sampling population and procedure, sampling design and sampling technique. Also, the data collection methods and instruments as well as data processing analysis were among the methods used to ascertain the stated objectives.

3.1 Profile of Study Area

The study area was the Amansie West District, which is located in the Southwestern part of Ashanti Region. It is one of the 27 districts in the Ashanti Region and one of the most deprived with a land cover of about 1,364 sq. km and a total population of about 148,547 (2010 population census projection), accounting for adolescent population (aged 10 to 19 years) of 32,383. There are only three second-cycle institutions (Senior High Schools), which are not properly developed, available to the adolescent population. The district has no tertiary institution and there is no vocational or technical institute that provides training for future job opportunities. Job opportunities are lacking in the area, however, farming and small-scale mining provide the greatest jobs for the youth but they are inclined more

towards mining, which most of them are illegal. The mining activities in area attract host migrant mine-workers to the towns and villages.

The adolescent and youth are therefore at risk of illicit sex and are exposed to HIV and other STIs. The district is divided into 7 Health sub-districts and sub divided into 24 zones for easy access to healthcare delivery. Concerning health care infrastructure, Amansie West District has 21 health facilities. Doctor to patient ratio is 1: 29,709, Nurse to patients ratio is 1: 4,800, and Midwives (WIFA) ratio of 1:1,765 (GHS report Ashanti region, 2011).

3.2 Study Design

The study adopted a cross-sectional design using both qualitative and quantitative approaches to collect data. This technique gives a valuable insight into the question under study in order to ascertain the stated objectives. The combination of qualitative and quantitative approach was to ensure that the advantages of both qualitative and quantitative approaches are obtained which in turn will overcome limitations of one research approach. The use of quantitative approach prevented elements of bias in the gathering and presentation of data. The qualitative research approach on the other hand provides more in-depth and comprehensive information as data is gathered through open-ended questions.

3.3 Study Population

The targeted population consisted of adolescent between the ages of 10-21years in the districts, Heads of the health facilities, Head teachers in all the Senior High Schools in the district, High School head teachers (selected from each of the seven sub-districts) ,Opinion leaders, Senior officials each from the Ghana Health Service, Ghana Education Service, Department of Social Welfare and mobile network operators

3.4 Sample and Sampling Technique

There are seven sub-districts in Amansie West namely; Agroyesum, Antoakrom, Edubia, Essuowin, Keniago and Manso Nkwanta. In order to have a fair idea about the whole districts with regards to the study and also for generalization, a sample size of 425 respondents and participants were used for the study. 384 adolescents were selected using simple random sampling technique, 11 Heads of each of the health facilities were selected using a simple random sampling technique, 3 Head teachers from the three (3) Senior High Schools in the district were selected using a purposive sampling technique, 12 Junior High School head teachers were selected using a purposive sampling technique, 7 Opinion leaders were selected using a purposive sampling technique, 2 Senior officials were selected for the study, each from the Ghana Health Service, Ghana Education Service and Department of Social Welfare using a purposive sampling technique and 2 mobile network operators were selected using convenience sampling technique.

Study variables

Variable	Operational Definition	Scale of Measurement
Socio-Demographic characteristics	- Age - Educational Level - Occupation - Marital status of clients - Cultural values	Ordinal Ordinal Nominal Nominal Nominal
Availability of Mobile Infrastructure	- Mobile networks are availability in the study area - Household have mobile phone availability - Does the adolescent have a mobile phone or easy access to mobile phone? - Are the avenues to buy or repair broken phones? - Are there avenues to buy and re-charge phone credits? - Are there available energy sources to phone charging?	Categorical/Nominal Categorical/Nominal Categorical/Nominal Categorical/Nominal Categorical/Nominal Categorical/Nominal

Cost Implications	- Who bought the phone - Who buys the credit - How much credit per week - cost of charging Phone - Cost of phone repairs	Categorical/Nominal Categorical/Nominal Interval Interval Interval
Interest of Adolescent in the use of technology as a tool for counseling	- Who do the adolescent consult - on any question about sexuality? - Would the adolescent prefer to ask question or discuss sexuality problems with someone phone? - Who the adolescent prefer - a known or unknown person	Nominal Nominal Nominal
	Reasons for preference.	Nominal
Interest of Stakeholders in Health and education in the technology as a tool for counseling	- Existing adolescent-sexual reproductive health services and activities in the district - Challenges in addressing adolescents' health concerns in the district - Extent to which the district health system utilizes mobile phone in health care delivery. - Opinion on mobile phone as tool for adolescent sexual-reproduction counseling	Nominal Nominal Nominal Nominal

3.5 Sample Size Estimation

Sample size was estimated using Cochran's sample size formula, $n_0 = \frac{t^2 * (p)(q)}{d^2}$.

Where n_0 = sample size for a population > 10,000 (i.e. 32,383); t = standard normal deviate = 1.96; p = prevalence rate, that is, proportion of target population estimated to have the particular characteristic of interest (in mobile technology) of the study population $q = 1 - p$ (50%); and d = degree of accuracy, set at 5% and a confident interval of 95%.

Therefore,
$$n^0 = \frac{(1.96)^2 \times 0.50 \times 0.50}{(0.05)^2} = 425 \text{ subjects}$$

Table 3.1: Sample Estimation

Sub-district	2010 Population Projection	Adolescence (10-21 years) Population	No.of Communities	No.of Selected Communities	No.of Respondents
Agroyesum	20,426	4453	28	5	53
Antoakrom	23,393	5100	24	6	60
Edubia	23,201	5058	26	6	61
Essuowin	30,051	6551	20	8	88
Keniago	14,903	3249	21	4	49
Manso Nkwanta	18,294	3988	19	5	57
Tontokrom	18,279	3985	24	5	57
District Total	148,547	32,383	162	38	425

3.6 Data Collection Method and Instrument

The instrument for data collection was a questionnaire made up of closed and open ended questions and interview guide. The questionnaire was used to avoid data deficiency

problem as to have control over the data to suite the study. Ten enumerators were trained for the administration of the questionnaire and the direct interview. The questionnaire was pre-tested on 10 respondents for each category who were not part of the sample size and the appropriate correction in the instruments was made before it was used for the study. For the focus group discussion, there was a guided outline (questionnaire) which was used so that the respondents will not be off track.

Table 3.2: Summary of Data Collection Techniques, Tools and Participants

Participants/Subjects	Number	Technique	Tools
Adolescents aged 10-21 years	384	Interviewed separately using face-to-face approach to collect information on sociodemographic, interest in mobile technology, availability of the technology and cost implications.	Structured questionnaire
The District Director of Health Services, all heads of 11 health facilities, headmasters in all the 3 Senior High Schools and 12 head teachers (3 selected from each of the seven sub-districts)	26	Interviewed separately using face to face approach to collect information on current availability of adolescent counseling in the district and their interest in the use of mobile technology as a tool for adolescents counseling	Structured questionnaire
Opinion leaders selected from each sub-district (One FGD in each sub-district).	7 Focus groups (7-9 members in each group)	Focus Groups Discussions (FDGs) – Interactive group discussions using interview guide and documenting the process with recorder and making notes alongside. Solicit their views on cultural acceptance of mobile technology.	Interview guide, recorders, notepad & pen
Senior officials each from the Ghana Health Service, Ghana Education Service, and Department of Social Welfare.	6	Interviewed them one-on-one in their offices for their interest and willingness to adopt the technology in the near future.	Interview guide

Mobile network operators	2	Interviewed them one-on-one in their offices	Interview guide
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3.7 Source of Data

The source of data for the research consisted of both primary and secondary data. Primary data were extensively used, where a structured questionnaire as well as interview guide was used. Also, secondary data were used; this was obtained from the district health annual report, journals and the Ghana statistical service, Kumasi office as well as the internet.

3.8 Data Processing Analysis

Both descriptive and inferential statistics was used in the data processing and analysis. The analysis was done with the aid of the Census and Survey Processing System (CSPPro) and Microsoft Excel 2007. Also, research questionnaires gathered through Focus group discussions were analyzed. With the descriptive statistics frequency distribution tables, histogram, and pie chart was done to determine if there were enough cases for some variables where as for the inferential statistics Chi-Square distribution test was used.

3.9 Ethical Considerations

The research proposal was subjected to the ethical reviews by the Committee on Human Research, Publications and Ethics of the Kwame Nkrumah University of Science and Technology (KNUST), the District Director of Health Services and the Health Management Team for ethical clearance to conduct the study. The study did not in any way expose participants of the study to physical or psychological harm. Participation in the study was strictly participatory with the informed consent of participants that

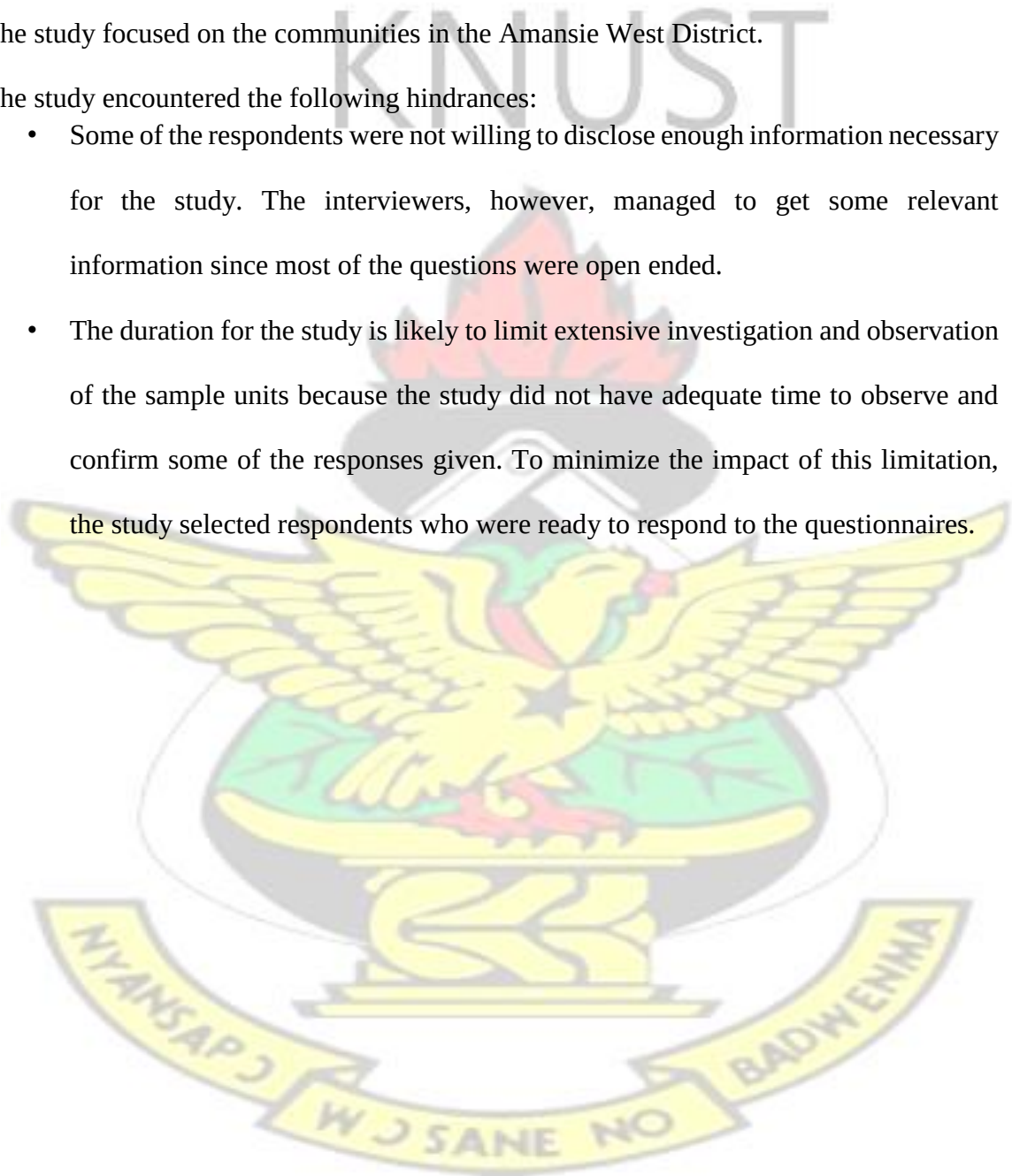
guaranteed their right to privacy. Information obtained was treated with the strictest confidentiality and integrity.

3.10 Limitations of the study

The study focused on the communities in the Amansie West District.

The study encountered the following hindrances:

- Some of the respondents were not willing to disclose enough information necessary for the study. The interviewers, however, managed to get some relevant information since most of the questions were open ended.
- The duration for the study is likely to limit extensive investigation and observation of the sample units because the study did not have adequate time to observe and confirm some of the responses given. To minimize the impact of this limitation, the study selected respondents who were ready to respond to the questionnaires.



CHAPTER FOUR

RESULTS

4.0 Introduction

The procedure for analyzing data collected has been described in the previous chapter. Actual output of analyses and corresponding discussion are presented in this chapter in line with stated objectives in chapter one. These outputs are gathered from different tests and quantitative analysis conducted towards answering research questions.

4.1 Socio-Demographic Characteristics of Respondents

This section of the analysis examines the demographic and household information such as age, highest educational level, occupation, marital status, religion, heads of households, household members of adolescents in the Amansie West District.

4.1.1 Age of Respondents

Table 4.1.1: Respondents' Age

Age Group (Year(s))	Frequency	Percent (%)
12-15	127	29.9
16-18	190	44.7
19-21	108	25.4
Total	425	100.0

Source: Field survey, 2012

Table 4.1.1 indicates that 190 (44.7%) of the respondents (adolescents) were between 16 to 18 years of age, 127 (29.9%) of them were between 12 to 15 years of age and 108 (23%) of them were between 19 to 21 years of age. This indicates that all the respondents lie within the adolescent age range, thus, 12 to 21 years.

The average age of the respondents who participated in the study is 17. In addition, the median age is 16 and the modal age is 15.

4.1.2 Educational Level of respondents

Table 4.1.2 Level of Education

Level of Education	Frequency	Percent (%)
No Education	64	15.1
Primary	54	12.7
JHS	237	55.8
SHS	62	14.6
Tertiary	8	1.9
Total	425	100.0

Source: Field survey, 2012

Table 4.1.2 displays the Level of Education of the respondents. The table shows that Majority (55.8%) of the respondents had completed Junior High School (JHS), a good number of respondents (14.6%) had completed Senior High School (SHS), a small number (12.7%) of the respondents' had completed primary and a few (1.9%) of them have attained tertiary education. Besides, 15.1% of the respondents had no formal educational.

4.1.3 Occupation of Respondents'

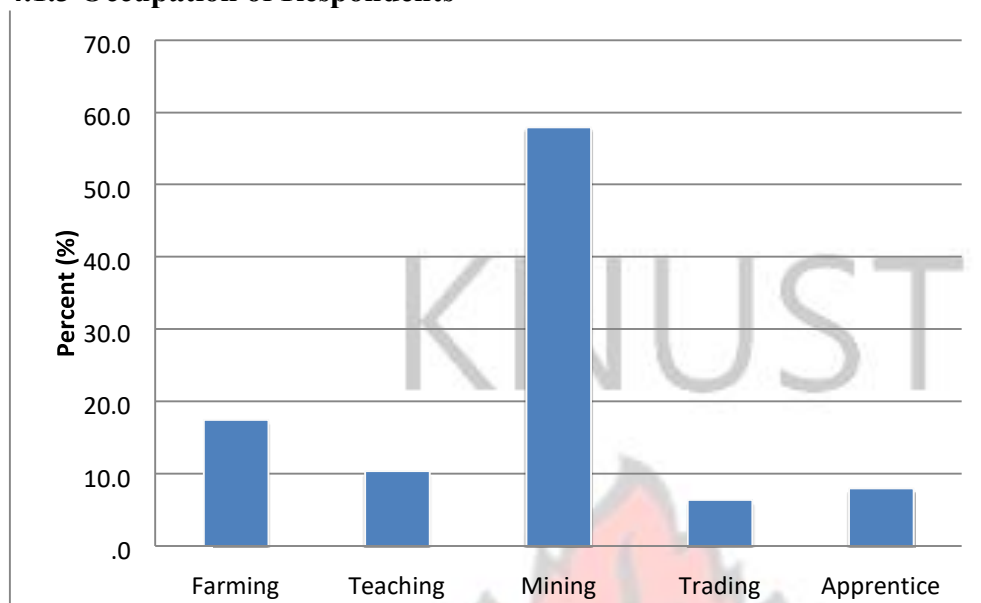


Figure 4.1.3: Respondents' Occupation

Source: Field survey, 2012

Figure 4.1.3 shows that majority, (57.9%) of respondents were miners, 17.5% of them were farmers, 10.3% of them were casual teachers (pupil teachers), 7.9% of them were apprentice and 6.3% of them were traders. This implies that majority of the adolescent's in the Amansie West District were involved in small scale mining as school drop-outs (i.e. Galamsey).

4.1.4 Marital Status of Respondents'

Table 4.1.4: Respondents' Marital Status

Marital Status	Frequency	Percent
Single	369	86.8
Married	45	10.6
Divorced	7	1.6
Cohabiting/Living together	4	.9
Total	425	100.0

Source: Field survey, 2012

Table 4.1.4 indicates that 86.8% of the respondents' were single, 10.6% of them were married, 1.6% of them were divorced and 0.9% of them were cohabiting or living together.

4.1.5 Religion of Respondents'

Table 4.1.5: Respondents' Religion

Religion	Frequency	Percent
Christian	346	81.4
Muslim	64	15.1
Traditionalist	15	3.5
Total	425	100.0

Source: Field survey, 2012

From the Table 4.1.5, eighty one percent (81.4%) of the respondents were Christian, 15.1% of them were Muslims and 3.5% of them were Traditionalist.

4.1.6 Respondents Parents' Dependency

Table 4.1.6: Respondents Parents' Dependency

Response(s)	Frequency	Percent
Single parent (Father or Mother only)	171	40.2
Both parents	173	40.7
Family member	33	7.8
Self	48	11.3
Total	425	100.0

Source: Field survey, 2012

Table 4.1.6 depicts that 40.7% of the respondents' depends on both parents (i.e. father and mother), 40.2% of them depends on single parent (i.e. father or mother only), 11.3% of them depend on themselves and 7.8% of them depend on a family member.

4.1.7 Respondents' Household Size

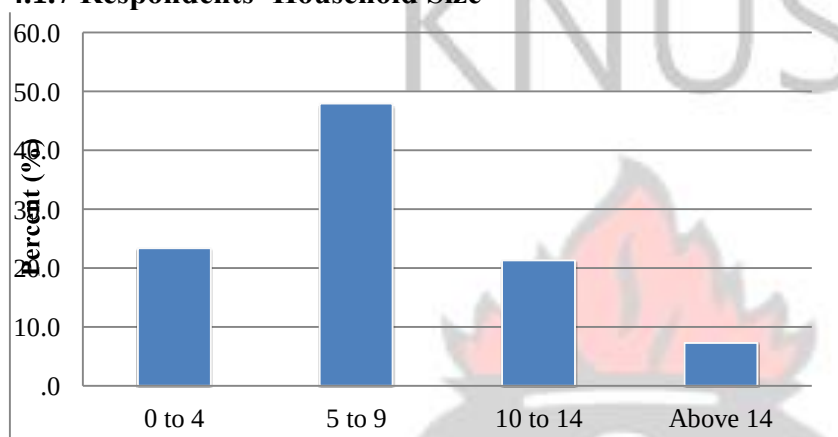


Figure 4.1.7: Respondents' Household Size

Source: Field survey, 2012

Figure 4.2 shows that majority (48%) of the respondents' have between 5 to 9-member household, 23.4% of them have between 0 to 4 member household, 21.3% of them have between 10 to 14 member household and 7.3% of them have above 14 member household.

4.1.8 Respondents' guardians Occupation

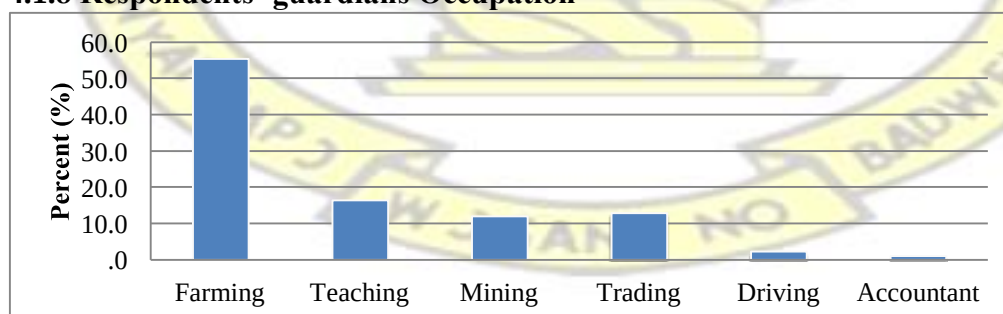


Figure 4.1.8: Respondents' guardians Occupation

Source: Field survey, 2012

Majority (55.4%) of the respondents' guardians were farmers, 16.4% of them were teachers, 12.9% of them were traders, 12.0% of them were miners, 2.2% of them were drivers and 1.1% of them were accountants.

4.1.9 Respondents' guardian average earnings in a month

Table 4.1.9: Guardian average earnings in a month

Amount (GH¢)	Frequency	Percent
0 to 100	196	46.1
101 to 500	121	28.5
501 to 1000	17	4.0
Above 1000	1	0.2
Missing value	90	21.2
Total	425	100.0

Source: Field survey, 2012

The Table 4.1.9 shows that 46.1% of the respondents guardians' earned between GH¢ 0 to 100, 28.5% of them earned between GH¢ 101 to 500, 4% of them earned between GH¢ 501 to 1000 and 0.2% of them earned between above GH¢ 1000. Besides, there was 21.2% missing values which were owing to non-response from respondents. This may be that respondents did not have any idea about their parent/guardian earnings and it may be that respondents fill reluctant releasing such information.

4.1.10 Respondents' guardian Educational attainment

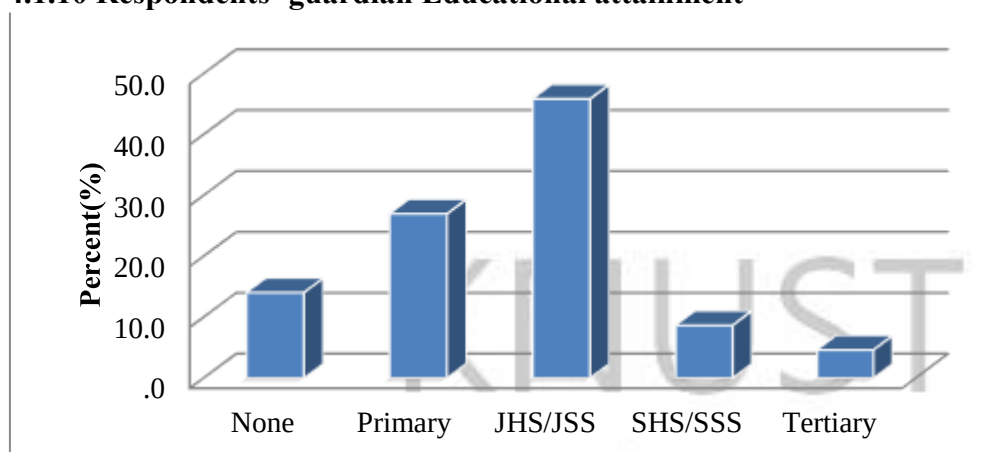


Figure 4.1.10: Guardian Educational attainment

Source: Field survey, 2012

About 46% of respondents' guardian educational level highest education attained was JHS/JSS, 27% of them had primary education, 8.6% of them had completed SHS/SSS and 4.6% of them had tertiary education. Also, 14% of them have no formal education.

4.1.11 Mobile phone providing the best option for addressing adolescents' health concerns

Table 4.2.1. Mobile phone providing the best option for addressing adolescents' health concerns

Response(s)	Frequency	Percent (%)
Yes	311	73.2
No	114	26.8
Total	425	100.0

Source: Field survey, 2012

Table 4.2.1 displays respondent's views on whether mobile phone provides the best option for addressing the health concerns of adolescents. From the table 4.2.1 majority of the respondents (73.2%) said 'Yes' mobile phone provide the best option for addressing

adolescents' health concerns while the minority of respondents (26.8%) said 'No' mobile phone does not provide the best option for addressing adolescents' health concerns.

4.2 Assessment of Mobile Network Infrastructural Availability

This section of the analysis examines the mobile network infrastructural availability

4.2.1 Mobile Network availability in the Communities

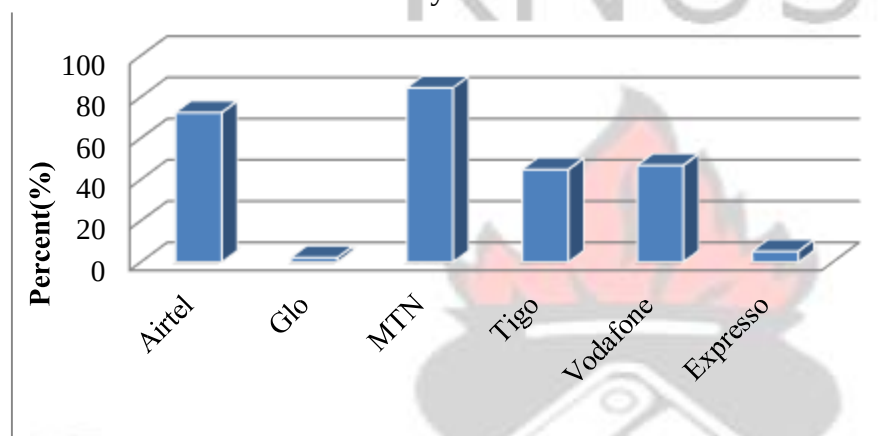


Figure 4.2.1: Mobile Network availability in the Communities

Source: Field survey, 2012

Figure 4.2.1 indicates a multiple response question in which respondents' have opportunity to give more than one answer. From the Figure, 84.4% out of the total sampled indicated that MTN is available in their communities, 72.4% out of the total sampled said that Airtel is available in their communities, 46.8% out of the total sampled said that Vodafone is available in their communities, 44.8% out of the total sampled indicated that Tigo is available in their communities, 5.2% out of the total sampled said that Expresso is available in their communities and 2.1% out of the total sampled indicated that Glo is available in their communities. Similarly, during the FGDs, most of the participants agreed that mobile phone service in their communities is recent, that is from 2007 to 2011. They agreed that mobile telephony services have developed faster in the area within that short period. Again in one-on-one interviews with some officials of Vodafone Ghana and Airtel Ghana in

Kumasi; they confirmed that their companies are fast connecting mobile telephony services to the rural Ghana to enhance socio-economic activities. They also confirmed that this is also to expand their business and to make more profit and further indicated that their companies have the vision of universal coverage of mobile connectivity in Ghana, which they hoped would be achieved sooner.

4.2.1 Regularity of Respondents' mobile network

Table 4.2.2: Regularity of Respondents' mobile network

Response(s)	Frequency	Percent (%)
Yes	90	21.2
No	141	33.2
Missing value(s)	194	45.6
Total	425	100.0

Source: Field survey, 2012

Table 4.2.2 shows that 33.2% of the respondents' indicated that they have irregular mobile network while 21.2% of them indicated that they have regular mobile network. However, there were missing values which owing to respondents' who do not have personal phones did not answer this question.

Result indicated that about 41% of the respondents' experience three (3) times no coverage of their network every week, 27% of them experience it twice a week, 16% of them experience it four times a week, 10% of them experience it once a week, 2% of the experience it five times a week and 1% of them experience it six times a week. Also, 2% of them experience nothing within a week.

Respondents said they cope with irregular coverage (or network failure) in case of emergencies by changing their SIM card, switch off phone, move network service point

and wait for phone coverage. Similar sentiments were raised by government agencies in health, education and social welfare; they called for much stability and a more universal coverage of mobile telephone network in Ghana, while we push for using technology to improve health services.

4.2.2 Mobile Network Coverage

Table 4.2.3 Mobile Network Coverage

Response	Frequency	Percent (%)
Yes	28	60.0
No	18	40.0
Total	46	100.0

Source: Field survey, 2012

About 60% of the Stakeholders indicated that the mobile network in the district is sufficient to support the mobile adolescent counselling, but 40% of them said otherwise.

4.2.3 Usage of Mobile phone

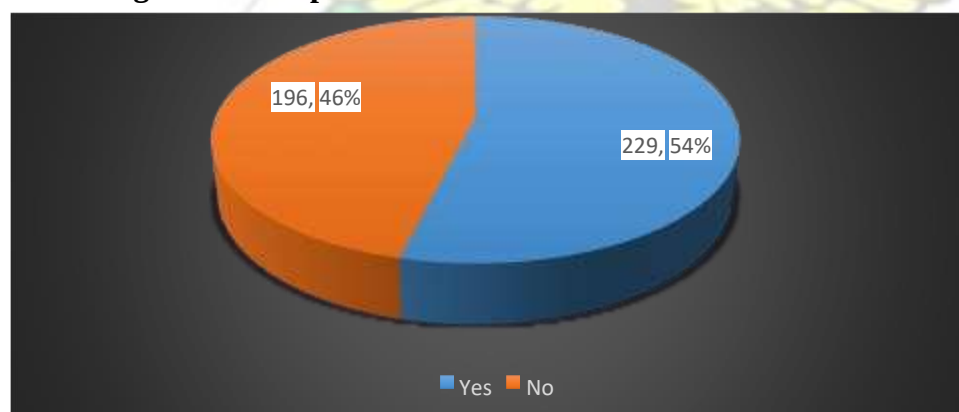


Figure 4.2.4: Usage of Mobile phone

Source: Field survey, 2012

About 54% of the respondents' have ever used a mobile phone before whiles 46% of them said otherwise. Fifty-three percent of those who have ever used phones said they used their

guardian or parent's phone, 33% of them said they used a friend's phone, 10% of them used a sibling phone and 4% of them used other family member mobile phone.

4.2.4 Mobile phone ownership within Households

Table 4.2.5: Mobile phone ownership within Households

Response(s)	Frequency	Percent (%)
Yes	342	80.6
No	83	19.4
Total	425	100.0

Source: Field survey, 2012

Majority (80.6%) of the respondents' indicated that someone owned mobile phones within their Households while a small number (19.4%) indicated that no one owned a mobile phone within their households. This was also confirmed during the Focus Group Discussions with community members. The various groups mostly reported that between 65% and 85% of household members owned mobile phones.

Results indicated that out of 80.6%, sixty-eight percent (68%) of those who had mobile phones in their household (HH) had less than 5 phones in their HH, 24.9% of them had between 5 to 9 phones in their HH and 7.1% of them had more than 9 phones in their HH.

4.2.5 Respondents' Mobile phone ownership

Table 4.2.6: Respondents' Mobile phone ownership

Response(s)	Frequency	Percent (%)
Yes	204	48.0

No	221	52.0
Total	425	100.0

Source: Field survey, 2012

Fifty-two percent (52%) of the respondents (adolescents) do not have their personal mobile phones whilst 48% of them have mobile phones.

Result shows that 42% of those who have mobile phones acquired it as a gift from parent or a family member, 38.6% of them bought it with their own money and 19.4% of them acquired it as gift from friends or someone not a family member

4.3 Cost implications of the use of Mobile technology in Amansie West District.

4.3.1: Amount of rechargeable credit Respondents' spend in a week

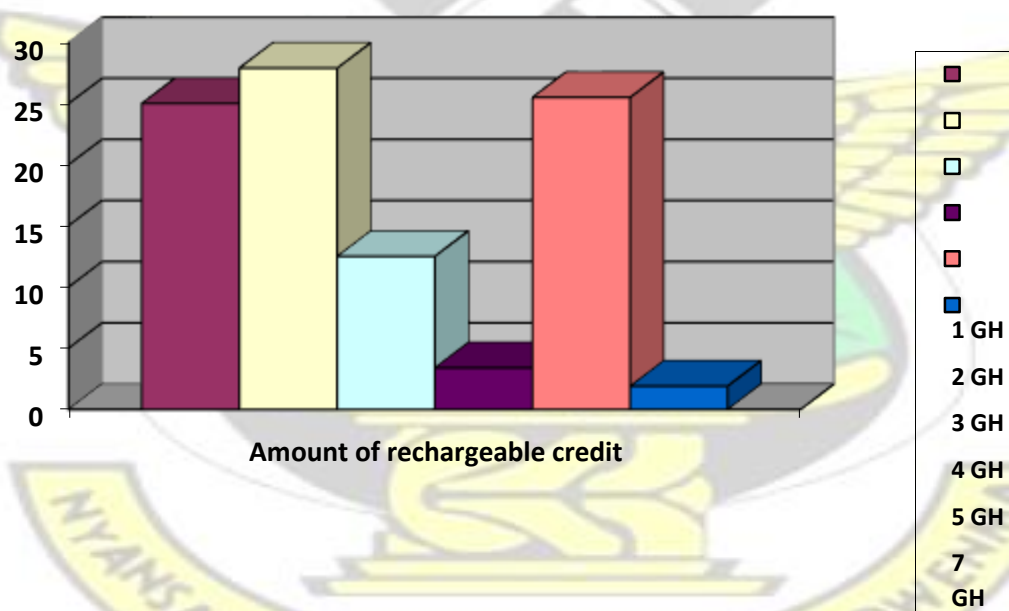


Figure 4.3.1: Amount of rechargeable credit Respondents' spend in a week

Source: Field survey, 2012

Figure 4.3.1 depicts that 27.9% of the respondents' recharge their phone with GH¢ 2 credits every week, 25.5% of them recharge with GH¢ 5 credits, 25% of them recharge

with GH¢ 1 credit, 12.5% of them recharge with GH¢ 3 credits, 3.4% of them recharge with GH¢ 4 credit and 1.9% of them recharge with GH¢ 7 credit every week. Besides, 3.8% of them do not recharge their credit every week.

Result indicated that 67% of the respondents' recharge their credit on their phone themselves, 28% of them said their parent or guardian recharge their credit for them, 2% of them said friends and 3% of them said a family member recharge their credit for them. The groups (FGDs), generally agreed that the cost of using a mobile phone is mainly on buying credit (re-chargeable cards). They gave range between Gh1 to Ghc15 per week depending on one's economic status. Most of them also shared the opinion that the young and educated ones spend more on credit. Most of them were of the opinion that since more people are buying mobile phones and using them they know it is within their means and more so mobile phones serves them better and therefore many predicted that many more people will continue to use mobile phones.

4.3.2 Cost of Charging Mobile Phone

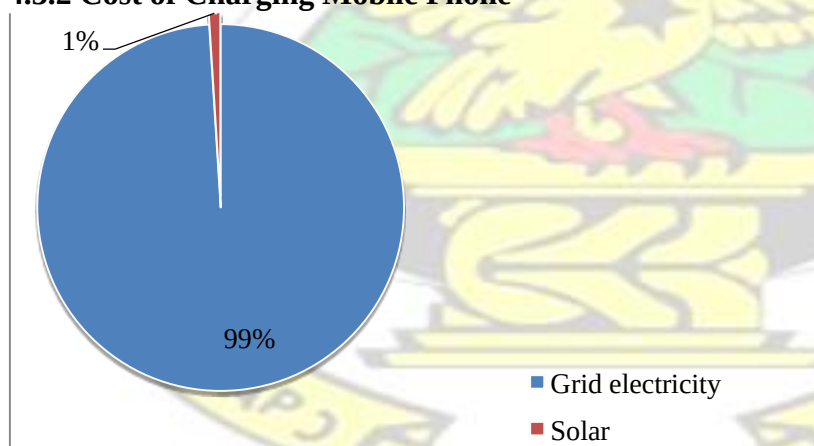


Figure 4.3.2: Cost of Re-charging

Source: Field survey, 2012

From the figure 4.3.2 majority (99%) of the respondents with mobile phone charge it by using grid electricity. However, 1% of them use solar power to charge their phones. Result shows that about 45% of them indicated that they spend above GH¢ 20 to charge their

phone in a year, 44% of them said they spend less than GH¢ 11 to charge their phone in a year and 11% of them said they spend GH¢ 11 to 20 to charge their phones.

Notwithstanding, 54.6% of respondents' with phones spend less than GH¢ 11 to repair their phones, 42.8% of them spend above GH¢ 20 to repair their phones and 2.6% of them spend GH¢ 11 to 20 to repair their phones when faulty.

4.3.3 Cost of Repairs

Table 4.3.3 Cost of Repairs

Amount	Percent (%)
0 to 10 cedis	54.6
11 to 20 cedis	2.6
More than 20 cedis	42.8

Source: Field survey, 2012

4.4 Interest of Adolescent in the use of technology as a tool for addressing health concern

This section describes the interest in the use of technology as a tool for addressing health concern. The various responses to questions are explained.

4.4.1 Years of using mobile phone

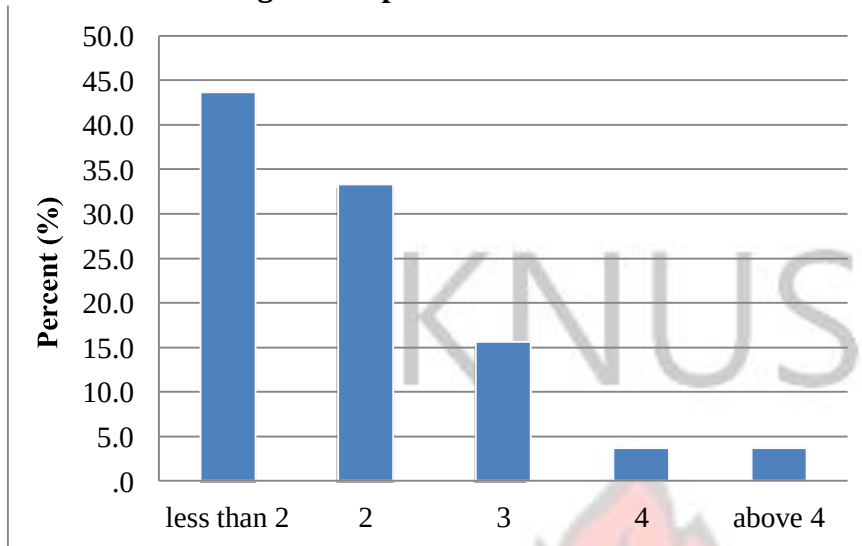


Figure 4.4.1: Years of using mobile phone

Source: Field survey, 2012

Figure 4.4.1 shows that majority (43.6%) of the respondents have used mobile phone for less than two years, 33.3% of them have used it for two years, 15.6% of them have used it for three years, 3.7% of them have used it for four years and 3.7% of them have use it above 4 years.

4.4.2 Motivation to use mobile phone by respondents'

Table 4.4.2: Motivation to use mobile phone by respondents'

Response(s)	Frequency	Percent (%)
Convenience	118	27.8
Emergency cases	86	20.2
Business purposes	17	4.0
Peer influence	13	3.1
Reduced cost of unnecessary travels	11	2.6
Missing value	180	42.4
Total	425	100.0

Source: Field survey, 2012

Table 4.4.2 depicts that 27.8% of the respondents are motivated to use mobile phone since is convenient, 20.2% of them use it for emergency cases, 4% of them use it for business purposes, 3.1% of them use it because of peer influence and 2.6% of them use it since to reduce cost of unnecessary travels. Besides, 42.4% of the responses were missing owing to non-response.

4.4.3 Mobile phone application normally used by respondents'

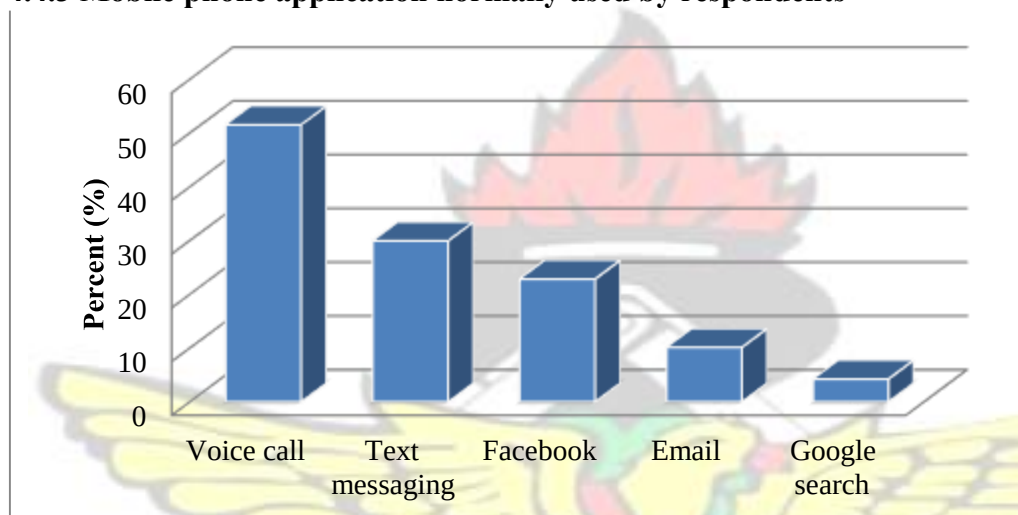


Figure 4.4.3: Mobile phone application normally used

Source: Field survey, 2012

Figure 4.4.3 indicates that 51.5% of the respondents normally use voice call, 29.9% of them frequently use text messaging, 22.8% of them normally use facebook, 10.1% of them use Email and 4.2% of them use google search engine.

4.4.4 Ever discussed any sexual reproductive issues before

Table 4.4.4: Ever discussed any sexual reproductive issues before

Response(s)	Frequency	Percent (%)
Yes	201	47.3
No	114	26.8
Missing value	110	25.9
Total	425	100.0

Source: Field survey, 2012

Table 4.4.4 shows that 47.3% of the respondents' have ever discussed sexual reproductive issue before whiles 26.8% of them said otherwise. But, there are 25.9% missing values which are owing to non-response from respondents. Respondents who have ever discussed sexual reproductive issues indicated that they consult their friends (37.6%), parent/guardian (16.0%), teacher (13.9%), health personnel (10.1%), family member (5.4%), no one (0.9%) and Community Health Workers (CHW) (0.7%).

4.4.5 Current Medium used in discussing sexual reproductive health issues

Table 4.4.5: Medium used in discussing sexual reproductive health issues

Medium	Percent (%)
Radio	24.0
Peers	37.2
Mobile phone	20.7
Parents	56.9
Church/mosque	7.5

Source: Field survey, 2012

Majority (56.9%) of the respondents presently discuss sexual reproductive health issues (SRH) with their parent(s), 37.2% of them with their peers, 24% of them radio programs, 20.7% of them said on mobile phone and 7.5% of them the church/ mosque

4.4.6 Reason for using mobile phone to discuss reproductive health issues

Table 4.4.6: Reasons for using mobile phone to discuss reproductive health issues

Response(s)	Frequency	Percent (%)
To reduce shyness	248	58.4
For convenience	138	32.5
Reduce cost of commuting	49	11.5
Fear of parent	3	0.7

Source: Field survey, 2012

This part of the analysis represents a multiple response question in which respondents had the opportunity to give more than one answer.

From the Table 4.4.6, 58.4% out of the total sampled indicated that if they discuss reproductive health issues on phone it reduces shyness, 32.5% of them said it is convenient, 11.5% of them said it reduces cost of commuting and 0.7% of them said because of fear of parents.

4.4.7 Preference to seek advice and counselling on reproductive health issues via phone

Table 4.4.7: Preference to seek advice and counselling on reproductive health issues via phone

Response(s)	Frequency	Percent (%)
Yes	224	52.7
No	90	21.2
Missing value	111	26.1
Total	425	100.0

Source: Field survey, 2012

Table 4.4.7 shows that more than half (52.7%) of the respondents' feel comfortable seeking advice and counselling on reproductive health issues via phone, however, 21.2% of them said otherwise. Besides, there was 26.1% missing value which is non-response from respondents. . Again, this was confirmed during the FGDs; most of the participants held the view that there is nothing wrong for parents to share their phone with their growing children. Most of them confirmed: “even this is what prevails in most of the households; most parents depends on their children to use the phones effectively due to the fact that most adults in our rural communities are illiterates”.

More than half of the participants agreed that parents would want to spend more money in order to share their phones with their growing children. Again, most of them endorsed that most parents will spend even more only if they understand the benefits their children would derive from receiving advise on sexual & reproductive health using mobile phones.

The 21.2% of adolescents, who responded ‘No’ to the use of mobile phone for counselling, indicated that they are not comfortable because is not good for them, they do not have personal phones and wants to meet the counsellor face-to-face.

The 52.7% of adolescents (respondents) who prefer the use of mobile phone, said that reduction of shyness, convenience, reduction of cost of commuting are reasons for which they prefer seeking advice and counselling on reproductive health issues via phone.

Finally, respondent's majority who were comfortable with mobile phones indicated that they will prefer advice and counselling from health professional (55.3%), teacher (7.5%), Clergy (3.5%) and community opinion member (0.7%).

In a face to face interview with the Ashanti Regional Director of Social Welfare, he endorsed the use of mobile technologies as counselling tool for the adolescents as an excellent idea because it could be more affordable and sustainable for government. He also indicated that the technology would ensure confidentiality for the adolescent and it could also remove the issue of stigma. He again discussed that the mobile technology would reduce the cost and risk of adolescent traveling to access Adolescent/youth counselling centres physically. The officer revealed further that, most adolescents feel shy to discuss sexuality problems with adults face to face and therefore remote counselling would be of great benefit. He continued that sometimes the situation of the adolescent could be a distress one that it would need immediate intervention and suggested therefore that mobile technology could help relay the information immediately. He, however, indicated that information security is an important issue to consider and therefore advised against the use social media, Facebook, twitter and those that have potentials of information leakage. He recommended voice, text and WhatsApp messaging.

Asked, whether there could be any disadvantages in using the mobile technology for adolescent counselling, he responded: "sometimes during face to face counselling, the facial expression and body language of the counselee helps the counsellor a lot but with remote counselling this could be missing if it is without video – "the voice will be saying something and the body also communicating something different so therefore observing the counselee at the same time is useful during counselling".

Officials from health, education and providers of mobile telephony services shared same support for mobile telephony as a better way of providing sexual reproductive health

counselling for the adolescent. The Ashanti Regional School Health Education Programme Coordinator in conclusion remarked: “if I have my own way I would push for the government and other stakeholders for the use of mobile technology for counselling right away”.

4.4.8 Willingness among adolescent in the district to use mobile technology as a tool for addressing adolescents health concerns

Table: 4.4.8 Willingness among adolescent in the district to use mobile technology

Response	Frequency	Percent (%)
Yes	46	100.0
No	0	0.0
Total	46	100.0

Source: Field survey, 2015

Table: 4.4.8 shows that, one hundred percent of the stakeholders said that adolescent in the district will be willing to use mobile technology as a medium for counselling whiles none of them said otherwise.

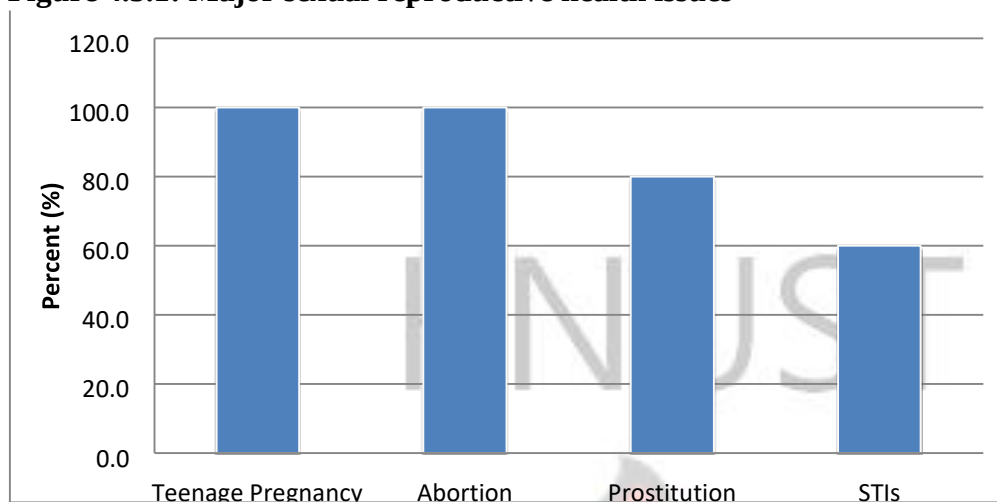
Stakeholders were of the view that this will help to reduce shyness from the adolescent in seeking sexual reproductive health information and support.

4.5 Interest among Stakeholders in Health and education in the use of technology as a tool for addressing adolescent health issues

This section of the analysis examines the Stakeholders in Health and Education in the Amansie West District views on feasibility and acceptability of the use of Mobile Technology for Adolescent Counselling in sexual and reproductive health in the district.

4.5.1 Major sexual reproductive health issues

Figure 4.5.1: Major sexual reproductive health issues



Source: Field survey, 2012

This part of the analysis represents a multiple response question in which the respondents have the opportunity to give more than one response. From the Figure, all the Stakeholders indicated that Teenage pregnancy and Abortion is a main sexual reproductive health issues in the district. Also, 80% of them said prostitutions a major sexual reproductive health (SRH) issues whereas 60% of the said sexually transmitted diseases (STI's) a major SRH issues in the district.

4.5.2 Adolescent sexual reproductive health services and activities in the district

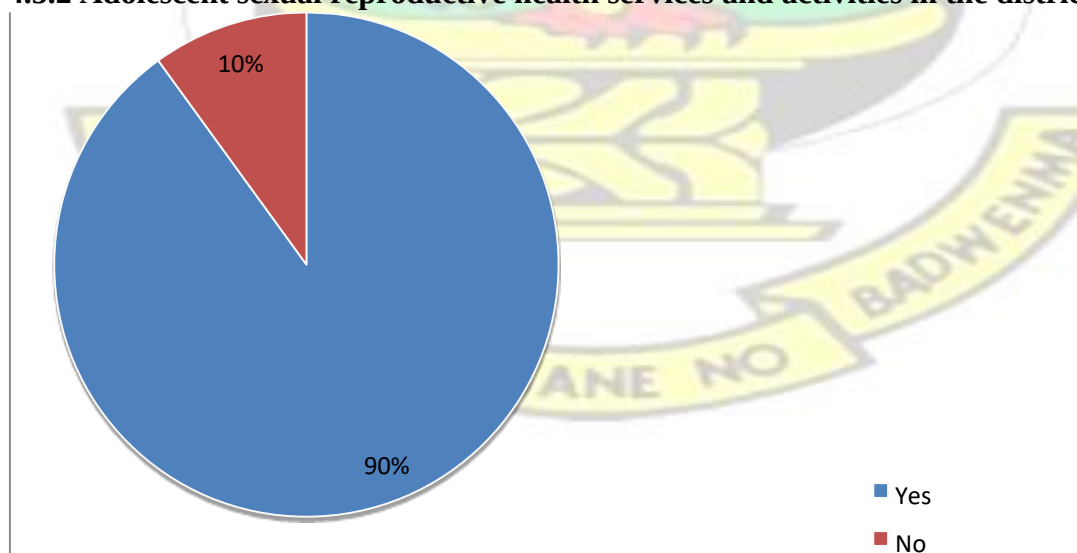


Figure 4.5.2: Adolescent sexual reproductive health services and activities in the district

Source: Field survey, 2012

Most (90%) of the Stakeholders depicts that the district have adolescent sexual reproductive health services and activities while 10% of them responded otherwise. From the Stakeholders who responded 'Yes', they said that the major services and activities provided by district is just creation of Gender Clubs in Schools to educate adolescent and teenagers within the district, also, having School health campaigns and community debriefing of the youth, adolescent and teenagers concerning the effect of sexual reproductive health issues, however, these activities are not happening as they should due to resources constraints.

The Regional Managers in Health, Education and Social Welfare in Ashanti Region also confirmed that; there exist several adolescent health policies in Ghana but most of them are being implemented slowly and ineffectively or not being implemented at all. They indicated that budgetary constraint has been the main issue.

4.5.3 Challenges in addressing Sexual Reproductive health concerns

Table 4.5.3: Challenges in addressing Sexual Reproductive health concerns

Response	Frequency	Percent (%)
Illiteracy	46	100.0
Lack of transportation	46	100.0
Small scale mining activities (Galamsey)	46	100.0

Source: Field survey, 2012

Table 4.5.3 shows a multiple response question in which the respondents had the opportunity to give more than one answer. From the Table, all the respondents indicated that high rate of illiteracy in the district hugely contributes to adolescent health issues in the district. Also, lack of transportation has been a problem in the district owing to poor roads. Finally, small scale mining activities (Galamsey) have been a major issue in the

district which have attracted a lot of people in the area thereby promoting sexual activities especially among the teens.

In an in-depth interview with Focus Groups in the community, they registered their frustration on how difficult it has become to advise the adolescents on sexual reproductive issues. The elderly groups especially discussed that: there is no organized way of controlling the young ones as it used to be some 50 years ago, when the queen mothers and women leaders organized “bragoro” (puberty rites) for the growing girls”- some of the queen mothers and some elderly women lamented.

Most of them said it has now become very difficult for most of the growing young ones to heed to advice of the elderly. They were with one voice that the churches and mosques are also doing their best but the problems still persist and even worsening.

Virtually there seems to be loss of control and a helpless situation in dealing with adolescent health issues in the communities. They agreed that a better way must be found to address the situation.

Similarly, Deputy Ashanti Regional Director of Health indicated that the Ghana Health Service had already recognized that from the 1990s, it was clear that adolescent related health problems, especially reproductive health were on the increase and therefore the need to focus on adolescent reproductive health. He continued that adolescent pregnancies, child-bearing, abortion; sexually transmitted infections, harmful traditional practices and other reproductive health disorders had become very important concerns that need both primary and secondary interventions.

4.5.4 Appropriateness of the use of mobile technology as a tool for addressing adolescent on sexual reproduction

Table 4.5.4: Appropriateness of the use of mobile technology as a tool for addressing adolescent on sexual reproduction

Response	Frequency	Percent (%)
Yes	46	100.0
No	0	0.0
Total	46	100.0

Source: Field survey, 2015

Table 4.5.4 shows that all the respondents agreed that mobile technology (e.g. mobile phone applications), is appropriate medium for counselling adolescents on sexual reproduction.

Respondents indicated that using mobile technology will be appropriate since it will help to reduce shyness, reduce cost, risk of travelling and keep adolescent information confidential.

Regional Managers of Health, Education and Social Welfare in Ashanti equally agreed that mobile technology is appropriate for sexual reproductive health in counselling the adolescent.

CHAPTER FIVE

DISCUSSION

5.0 Introduction

This chapter seeks to discuss the estimates obtained in chapter four in relation to the stated objectives. The stated objectives will be discussed into detail with the results obtained.

5.1 Findings related to the demographic characteristics of the adolescent.

Ojo (2006) states that a high level of illiteracy, poverty, and absence of basic infrastructure prevents most people from adopting the mobile device. This study however revealed that the maximum age was twenty-one years (21years) while the minimum age was twelve

years (12 years) giving a range of nine years (9 years) with an average age of seventeen (17) years. Among the adolescent interviewed, 56% had attained junior high school, 15% had Senior high school education, 13% had primary education (from primary one to six) while only 2% had just tertiary education and 15% of the adolescent had no form of education. Again, 71% of the respondents were still in school and those who were not in school had engaged themselves in occupations such as mining (58%), farming (18%), teaching (10%), apprenticeship (8%) and trading (6%). Majority of the respondents who were not in school do small-scale mining because it's the most lucrative occupation in the area. 87% of the respondents were also not married. Majority of the respondents 81% were Christians, 15% were Muslims while just 4% were traditionalist. For parents' dependency, 41% depends on both parents, 40% depends on single parents (either mother or father), and 8% depend on family member while 11% provide for themselves such as shelter, food, clothing and other needs. The 11% who provide for themselves could largely be the adolescents who were not in school. The average earnings for respondents' guardian in a month was less than GHC 100 for the majority, where most of them were farmers (55%), 48% of the respondent had a household size between 5-9 members while, majority, (46%) of the guardians had attained Junior high school education. Interestingly, majority of the adolescent interviewed, (56%) had attained junior high school.

5.2 Availability of Mobile Network Infrastructure

In order to determine whether mobile devices could be used to address the health concerns of adolescents, the study sought to find out the Availability of Mobile Network Infrastructure in the selected communities. Respondents were asked to indicate the availability of mobile networks in their community and 84.4% out of the total sampled

indicated that MTN is available in their communities, 72.4% out of the total sampled said that Airtel is available in their communities, 46.8% out of the total sampled said that Vodafone is available in their communities, 44.8% out of the total sampled indicated that Tigo is available in their communities, 5.2% out of the total sampled said that Expresso is available in their communities and 2.1% out of the total sampled indicated that Glo is available in their communities. This implies that majority of the sampled population have access to MTN network.

Similarly, during the Focus Group Discussions, most of the participants agreed that they had mobile phone services in their communities just recently; that is from 2007 to 2011. They agreed that mobile telephony services have developed faster in the area within the period. Again in one-on-one interviews with some officials of Vodafone Ghana and Airtel Ghana in Kumasi; they confirmed that their companies are fast connecting mobile telephony services to the rural Ghana to enhance socio-economic advancement. They also confirmed that it was also to expand their business and to make more profit and further indicated that their companies have the vision for universal coverage of mobile connectivity in Ghana, which they hoped would be achieved sooner. According to Ghyasi and Kushchu (2004), some of the reasons for low use of mobile devices, especially in developing countries, to access health information include poor technology infrastructure. Also, on the issue of network coverage, 3.2% of the respondents' indicated that they face irregular mobile network coverage while 21.2% of them said they have regular mobile network. However, there was missing values which owing to respondents who do not have personal phones and did not answer this question. Furthermore, about 41% of the respondents experience three (3) times no coverage of their network every week, 27% of them experience it twice a week, 16% of them experience it four times a week, 10% of them experience it once a week, 2% of them experience it five times within a week and

1% of them experience it six times in a week. Also, 2% of them have no such experience. Respondents indicated that they cope with irregular coverage (or network failure) in case of emergencies by changing their SIM card, switching off phone, move to network service point and wait for phone coverage. Similar sentiments were raised by government agencies in health, education and social welfare; they called for much stability and a more universal coverage of mobile telephone network in Ghana, while we push for using technology to improve health services.

Majority (60%) of the Stakeholders indicated that the mobile network in the district is sufficient enough to support the implementation of mobile adolescent counselling, however 40% of them said otherwise. This implies that network reliability will not be a barrier to the implementation of the use of mobile in addressing adolescent health concerns. The findings contradicts with that of Biljon & Kotzé (2008) and Jeng et al.(2004) who indicated that One major barrier to the device's implementation is a reliable network system to access health information and transmit data from health personnel to patients and vice versa. Similarly, Ashraf, Gine, and Karlan (2005) observe that sometimes, an unreliable phone network makes it difficult to maintain or use the device, especially in rural and other medically underserved communities.

Moreover, majority (80.6%) of the respondents' owned mobile phone within their households whereas (19.4%) of them do not have mobile phone within their households. This was also confirmed during the Focus Group Discussions with community members. The various groups mostly reported that between (65%) and (85%) households owned mobile phones.

This implies that mobile devices to access services will not be a hindrance. Ojo (2006) was of the view that high level of illiteracy, poverty, and absence of basic infrastructure prevents most people from adopting the device.

5.3 Cost implications of the use of Mobile technology

Respondents (adolescents) do spend their resources in terms of money and time to acquire mobile phones and its applications respectively without taking into consideration mobile network availability in their respective communities and whether they can afford or not. In cases where the adolescent cannot afford, it puts pressure on the guardian to acquire mobile phone for his/her ward. However, because most of the respondent's do not have electricity at their respective homes, they do charge their phones elsewhere at a cost. Idowu, Cornford, and Bastin (2008) assert that most traditionally hard-to-reach individuals are without an electrical power supply. Hence, it becomes hard to maintain the device. Less than half (45%) said they do spend over GHC 20 in charging their phones a year, 44% spend GHC 11 while 11% spend GHC 11 to 20 to charge their phones a year. Slightly more than half spend less than GHC 11 to repair their phones, 43% spend more than GHC 20 for repairs while less than 4% spend GHC 11-20 for repairing their phones when faulty. This implies that those who do not have that amount could not use mobile device. The findings support that of Frempong, Essegbey, and Tetteh (2007) who indicated that the initial costs for obtaining the device as well as ongoing service costs in terms of purchasing mobile phone credits influence an individual's usage.

Furthermore, the amount of rechargeable cards adolescents spend a week for talk time is considerably moderate as 28% of the adolescent recharge their phones with GHC 2 every week, 26% recharge GHC 5, 25% recharge GHC 1 while 13% recharge GHC 3. Again 4% recharge GHC 4, and just 2% do recharge GHC 7 every week with just 4% not recharging their phones every week. Almost all of the adolescent do recharge their cards every week with 28% buying more recharge cards every week cumulatively. With those adolescent who buy recharged cards, majority (67%) do buy the cards on their own while

with the remaining 33%; it is either recharged by their guardian, parent, friend or a family member. This means that most of the adolescent do buy the recharged cards themselves for talk time. Mechael (2006) agrees that the initial startup cost situates the device into the hands of a large number of individuals. When it comes to employing the device for health information and emergency-related benefits, however, household individuals could share their mobile phones with others.

5.4 Interest of Adolescent in the use of technology as a tool for addressing health concerns

The respondents gave various mediums via which health matters specifically reproductive health were currently discussed, these include; radio, among peers, parents, church/mosque and through mobile phones. 57% of the respondents reported that, parents educate them on adolescent health, 37% were through their peers, 24% via radio, 21% through discussion via phone either by peer, or any other person while just 8% were at the churches / mosque; this indicating parents' concerns and worries about sexual reproductive health of their wards. 47% of the adolescents had ever discussed any sexual reproductive issues while 27% had never discussed any sexual reproductive issues and 26% did not give any response.

The study asked if mobile phone would be the best medium for discussing reproductive health for adolescents and most of the respondents said yes and the follow-up question was to give reasons why the use of mobile phones for discussing reproductive health issues. 58% of the adolescent reported that, it will reduce shyness, 33% said for convenience, 11% said it will reduce the cost of commuting while 1% said using mobile phones to discuss reproductive health, it will take away fear of parents by the respondents (adolescent). These reasons suggest that the respondents had the notion that counseling through mobile

phones will reduce most of the challenges hindering adolescents from seeking sexual reproductive health support.

On preference to seek advice and counseling on reproductive health issues via phone, 53% of the adolescent said they prefer to seek advice and counseling via phone while 21% said no and 26% did not give any response. Mechael, Batavia, Kaonga, Searle, Kwan, et al. (2010) are of the same view and admit that the use of mobile phones to perform activities related to health is transforming many lives across the world in general and, specifically, many low-income communities.

Mechael (2009) and Greenspun and Coughlin (2013) express that the ubiquity of mobile phones and allied technologies, as well as their related features, harness the ability to communicate and transfer information, specifically health information, within both “literate” and “illiterate” populations. The findings also support that of mHealth Ethiopia Report (2011), which adds that medical and health practices also perform activities ranging from the use of simple mobile phone based applications to transfer of health information on mobile phone via SMS, to highly sophisticated diagnostic applications that rely on advanced equipment and robust backend data systems. This process tends to reduce health challenges confronting many individuals, such as cost of transportation to obtain health information and shortages in medications (WHO, 2011).

mHealth Ethiopia (2011) adds, for example, that the service of using mobile phones to communicate with healthcare personnel and other healthcare delivery agencies has the potential to greatly address health and other associated issues faced by most individuals, and improve the efficiency of communication between patient and healthcare workers, thereby reducing life-threatening delays in the delivery of care and extending the reach of the health system to underserved communities.

Focus group discussions with community leaders gave the impressions that the modernday adolescent are no more interested in the traditional ways of providing counseling and therefore the use of mobile technology could be the way forward. Interviews with some senior regional managers in Social Welfare, Ghana Health Service and Ghana Education Service also expressed concerns that some efforts are currently being made but very little is being achieved. These senior managers were of the view that mobile technology for counseling adolescent could be more convenient and could achieve much more results if implemented.

Cumulatively, it can be established that, majority of the respondents, had the interest in using mobile phones to address adolescent health issues.

5.5 Interest among Stakeholders in Health and education in the use of technology as a tool for addressing adolescent health issues

Most stakeholders consulted for this study expressed their interest to invest in tele-health for the adolescent in the district, since they are the next generation of leaders in the district, region and the country at large. These stakeholders reported that, major sexual reproductive issues such as teenage pregnancy, prostitution, abortion and sexually transmitted diseases are the main health issues of concern in the district. This is as a result of the fact that the population of the adolescent in the district is quite substantial and these reproductive health issues are about the adolescents. Again, the stakeholders pointed out that, there are adolescent sexual reproductive health services and activities in the district such as gender clubs in schools to educate adolescent and teenagers within the district, having school health campaigns and community debriefing of the youth adolescent and teenagers concerning the effects of sexual reproductive health. This indicates that there is a positive action towards the interest of the stakeholders, government and other cooperate

entities on adolescent reproductive health. They also revealed that there have been some bottlenecks in addressing adolescent reproductive health such as limited or no budgetary allocation to carry out adolescent activities, transportation problems as well as small-scale mining in the district. The booming small-scale mining in the area pose greater risk since it attracts so many youth from other places to the district. Consequently, they were of the view that mobile technology is appropriate for counseling adolescent on sexual reproduction as it will reduce shyness, cost of traveling to the health facilities and keeping adolescent information confidential and also comments about the fact that mobile network coverage in the district is sufficient to support the mobile adolescent reproductive health counseling. Willingness to buy phones for the adolescents child for the purpose of sexual reproductive health counseling among stakeholders also existed, since its will help in enhancing the knowledge base of the adolescent on such important issues.

Among the bottlenecks in the use of mobile technology in adolescent reproductive health was network problems, however, the stakeholders believe that these challenges can be addressed by improvement of the connectivity by the network. Again, affordability of buying the phones since most households in the districts lives under the poverty line, nevertheless, household members were willing to share the use of their phones. It is believed that for individuals to feel comfortable in using mobile phones to perform any form of activity, certain factors such as affordability, suitability, and dependability of the device should be in place (Gerber et al., 2009; Rashid & Elder, 2009; van Biljon & Kotzé, 2008).

All the stakeholders made it clear that the acceptance of mobile technology to counsel adolescents in the district is culturally welcome for reproductive health.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.0 Introduction

This chapter seeks to conclude and make recommendations based on the estimates and discussions obtained from the previous chapters. These conclusions and recommendations would be made based on the stated objectives of the study.

6.1 Conclusion

6.1.1 Availability of Mobile Network Infrastructure

Majority of the respondents indicated that MTN is available in their communities. Also a significant number revealed that they experience no network coverage about three (3) times every week. Nonetheless, majority of the Stakeholders indicated that the mobile network in the district is sufficient enough to support the implementation of mobile adolescent counselling.

Further to this, it was revealed that mobile phone could be used to address the health concerns of adolescents in Amansie West District due to Availability of Mobile Network Infrastructure; however, some expressed the concern for the Telecommunication Operators (Telcos) to further improve mobile services.

6.1.2 Cost implications of the use of Mobile technology in Amansie West District. Cost

implications of the use of Mobile technology in Amansie West District is moderately low taking into consideration the cost of the phone, recharge cards, power to charge the phones and the cost of repairs cumulatively.

Majority of the respondents spend GH¢ 2 on credits every week. Also, it was generally agreed that the cost implications of using a mobile phone is mainly on buying credit

(rechargeable cards). A range between Gh1 to Ghc15 is normally spent depending on one's economic status.

Moreover, it was revealed that mobile phone could be used to address the health concerns of adolescents in Amansie West District due to Cost implications of the use of Mobile technology in Amansie West District.

6.1.3 Interest of Adolescent in the use of technology as a tool for addressing health concerns

Majority of the respondents were of the view that Mobile phone would be the best medium for discussing reproductive health of adolescents. They further indicated that using mobile phone to address adolescents' health concerns will be effective due to its convenience.

They also prefer to seek advice and counseling on reproductive health issues via phone. The community leaders also revealed that the modern-day adolescents are no more interested in the traditional ways of providing counseling and therefore the use of mobile technology could be the way forward.

Moreover, district staff and regional managers in Health, Education and Social Welfare revealed that mobile phone could be used to address the health concerns of adolescents as they wished the technology was rollout immediately.

6.1.4 Interest among Stakeholders in Health and education in the use of technology as a tool for addressing adolescent health issues

Stakeholders are interested in investing in tele-health for the adolescent in the district and they were of the view that mobile technology is appropriate for counseling adolescent on sexual reproduction as it will help reduce shyness, cost of traveling to the health facilities and help with keeping clients information confidential. Also, willingness to buy phones for adolescents for the purpose of sexual reproductive health counseling among

stakeholders existed, since it will help in enhancing the knowledge base of the adolescent on such important issues.

Moreover, it was revealed that mobile phone could be used to address the health concerns of adolescents in Amansie West District due to the Interest of Stakeholders in Health and education in the use of technology as a tool for addressing adolescent health issues.

6.2 Recommendations

1. Stakeholders at the community level should be prepared to support this initiative by actively getting involved, parents and family members in particular must be willing to give out their mobile devices and spend money to support their children to access the needed sexual reproductive health support via mobile phone.

Again, authorities in health, education, social welfare, community opinion leaders and most importantly Ghanaian adolescents, should advocate for the implementation of the use of mobile technology in addressing the health concerns of adolescents.

2. Telecommunication Operators (Tecos) should hasten to ensure that the network coverage to the District is stable and reliable and also try as much as possible to spread network coverage to all parts of the District.
3. The Central Government should support or provide assistance to such an initiative which will help tackle an important issue that has to do with Adolescent Reproductive Health.

Areas for further research:

Funding shall be sort to pilot the use of mobile technology as counseling tool for adolescents in a selected district (preferably a deprived district), where mobile technology is available. The study will focus on the impact of the technology (intervention). Lessons

learnt during the implementation processes shall be used to inform national policy and scale-up.

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APPENDICES

Appendix A: Questionnaire

RESEARCH QUESTIONNAIRE FOR ADOLESCENTS

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND
TECHNOLOGY/DEPARTMENT OF SOCIAL PHARMACY/ KUMASI
COLLABORATIVE CENTRE FOR RESEARCH (KCCR)**

Research Title: Mobile Technology and Adolescent health: Assessment of feasibility and acceptability of the use of Mobile Technology for Adolescent Counselling in sexual and reproductive health in the Amansie West District

Introduction

Good morning/afternoon/evening: I am a student at School of Medical Sciences, KNUST. I will be conducting several meetings with people like you in Amansie west district to find out your views and ideas about **“factors necessary to consider when one wants to implement the use of Mobile Technology for Adolescent Counselling in sexual and reproductive health”**. Your opinions are highly essential at the same time vital, as they will help us to improve the kind of service we provide. Whatever you say will be treated confidential, so feel at ease to express your candid opinion. Be assured that your responses will not in any way be linked to your identity. You are kindly requested to answer the questions below by indicating a tick or writing the appropriate answer when needed.
THANK YOU

Questionnaire number: -----

Date of Interview:-----

SECTION A: Demographic / Household characteristics

1. Age: (In years as at last birthday)

2. Highest Educational level attained: (Tick one)

i. None ☐ ii.

Primary ☐ iii. JSS

☐ iv. SHS/SSS ☐

v. Tertiary ☐

3. Are you still in School? Yes ☐ No ☐ (If Yes skip to 5)

4. What is your occupation?

i. Farming ☐

ii. Teaching ☐

iii. Mining ☐

iv. Trading ☐ v.

Apprentice ☐

vi. Other ☐ (specify)

5. Marital Status

i. Single

☐

ii.

Married

☐

iii.

Divorced

☐

vi.

Cohabiting/Living together

☐

v. Widow (er)

☐

6. Religion:

i. Christian

☐

ii. Muslim

☐

iii. Traditionalist

☐

iv. Other (specify) ☐

7. Who do you depend on?

i. Single parent (Father OR Mother only) ☐ ii.

Both parents

☐ iii.

Family member

☐

iv. Self

☐

v. Other (specify) ☐

8. How many people live in this household? (If Q7 is Self, End Section)

9. What is the occupation of your guardian or the one you depend on?

i. Farming

☐

ii. Teaching

☐

iii. Mining

☐

iv. Trading

☐

v. Driving

☐

vi. Other (specify) ☐

10. How much on the average do your guardian/parent earn in a month?

.....

11. What is the highest education level of your parent/guardian?

i. None ii.

Primary iii.

JHS/JSS iv.

SHS/SSS v.

Tertiary

SECTION B: mobile network infrastructural availability

12. What mobile network(s) is/are available in this community? (Tick more than One) i.

Airtel

- ii. Glo
- iii. MTN
- iv. Tigo
- v. Vodafone vi.
- Expresso

13. Is your network coverage regular? i. Yes ☐ ii. No ☐

14. How many times in a week do you experience low or no coverage?

.....

15. How do you cope with irregular coverage (or network failure) in case of emergencies?

.....

.....

16. Have you used mobile phone before?

- i. Yes ☐ ii. No ☐ (**If No end this section**)

17. If yes, whose phone did you use?

- i. Friend
- ii. Parent/Guardian
- iii. Sibling
- iv. Other family member
- v. Other (specify)

18. Does any member of this household own mobile phone?

- i. Yes ☐ ii. No ☐ (**If No skip to question 19**)

19. If yes how many phones are functional in this household? (**Provide figure**)

20. Do you have a mobile phone of your own?

- i. Yes ☐ ii. No ☐ (**If No skip to question 21**)

21. If yes how was it acquired?

- i. Gift from parent/family member
- ii. Gift from a friend or someone not a family member
- iii. Bought with my own money.
- iv. Other (specify)

SECTION C: Cost implications of the use of Mobile technology in Amansie West District

22. What is the source of charging your phone?

- i. Grid electricity
- ii. Solar
- iii. Generator
- iv. Other (specify)

23. How much credit do you spend per week to recharge your phone?

24. How much does it cost to charge the phone (*Estimation for one year*)?.....Ghc

25. How much does it cost to repair the phone (*Estimation for one year*)?..... Ghc

Interest of Adolescent in the use of technology as a tool for addressing health concern

26. How long have you used mobile phone?

27. What motivates you to use mobile phone?

- i. Convenience
- ii. Emergency cases
- iii. Business purposes
- iv. Peer influence
- v. Reduced cost of unnecessary travels
- vi. Other (specify)

28. What mobile application do you normally use? (*Tick by ranking where 1= lowest to 5= highest*)

- i. Voice calls ☐
- ii. Text messaging ☐
- iii. Facebook ☐
- iv. Email ☐
- v. Google ☐
- vi. Other (specify) ☐

29. Have you ever had any thought or discussed any sexual reproductive issue?

i. Yes ☐ ii. No ☐

30. Which of the following is the current medium used to discuss sexual reproductive health issues?

- i. Radio
- ii. Peers
- iii. Mobile phone iv. Parents
- v. Church/mosque
- vi. Other (specify)

31. Would you prefer to ask question/discuss/receive or seek advice and counseling on reproductive health issues via phone?

i. Yes ☐ ii. No ☐

32. Why would you want to use mobile phones to discuss reproductive health issues?

- i. To reduce shyness
- ii. For convenience
- iii. Reduce cost of commuting
- iv. Other (specify)

THANK YOU FOR YOUR TIME

**RESEARCH QUESTIONNAIRE FOR STAKEHOLDERS IN HEALTH AND
EDUCATION**

**KWAME NKRUAH UNIVERSITY OF SCIENCE AND TECHNOLOGY:
DEPARTMENT OF SOCIAL PHARMACY/ KUMASI COLLABORATIVE CENTRE
FOR RESEARCH (KCCR)**

Research Title: Mobile Technology and Adolescent health: Assessment of feasibility and acceptability of the use of Mobile Technology for Adolescent Counselling in sexual and reproductive health in the Amansie West District

Introduction

Good morning/afternoon/evening: My name is..... I am a student at School of Medical Sciences, KNUST. I will be conducting several meetings with people like you in Amansie west district to find out your views and ideas about **“factors necessary to consider when one wants to implement the use of Mobile Technology for Adolescent Counselling in sexual and reproductive health”**. Your opinions are highly essential at the same time vital, as they will help us to improve the kind of service we provide. Whatever you say will be treated confidential, so feel at ease to express your candid opinion. Be assured that your responses will not in any way be linked to your identity. You are kindly requested to answer the questions below by indicating a tick or writing the appropriate answer when needed. **THANK YOU**

Questionnaire number: -----

Age of Respondent... Sex:

Department: Health ☐ Education ☐

Date of Interview: -----

1. How long have you worked in this district?

- i. < 1year
- ii. 1year to 2years iii. 2years > 4years
- iv. 4years to 5years v. <5years

2. What are the main sexual reproductive health issues in this district? (List)

.....
.....
.....
.....

3. Does this district have any adolescent sexual reproductive health services or activities?

- i. Yes ☐
- ii. No ☐

4. If yes, please list them:

.....
.....
.....
.....

5. What are the challenges in addressing health concerns in this district? **(Please list them):**

.....

.....

.....

.....

6. Do you think modern technology (e.g. mobile phone applications) is an appropriate medium for counseling adolescents on sexual reproduction?

i. Yes ☐ ii. No ☐

7. If yes, list reasons:

.....

.....

.....

.....

8. If No, list reasons:

.....

.....

.....

.....

9. Do you think mobile network coverage in this district is enough to support adolescent counseling? i. Yes ☐ ii. No ☐

10. If you had an adolescent child would you buy or be prepared to share your mobile phone with him/her for the purpose sexual reproductive health counseling?

i. Yes ☐ ii. No ☐

11. Give reason:.....
12. Do you think adolescent in this district would appreciate the use of mobile technology as a tool or medium for counseling? i. Yes ☐ ii. No ☐
13. If yes, why?.....
.....
14. If No, why?:.....
.....
15. What do you think will be some of the challenges if we want to use mobile phone to counsel adolescents on sexual reproductive health issues? (List)
.....
.....
.....
.....
16. Do think these challenges you listed above can be overcome?
i. Yes ☐ ii. No ☐
17. If yes, How? :.....
.....
18. If No, why.....
.....
.....
19. Would you support the idea of government and cooperate bodies investing in establishment of call centers that will provide counseling and information on sexual & reproductive health issues for the adolescents? i. Yes ☐ ii. No ☐
20. Give reason(s) for your answer:.....
.....
.....
.....

THANK YOU FOR YOUR TIME

**FOCUS GROUP DISCUSSIONS (FGDS) WITH SELECTED COMMUNITY
OPINION LEADERS**

**KWAME NKRUAH UNIVERSITY OF SCIENCE AND TECHNOLOGY
/DEPARTMENT OF SOCIAL PHARMACY/ KUMASI COLLABORATIVE
CENTRE FOR RESEARCH (KCCR)**

**Research Title: Mobile Technology and Adolescent health: Assessment of feasibility
and acceptability of the use of Mobile Technology for Adolescent Counselling in
sexual and reproductive health in the Amansie West District**

Interview Guide:

Introduction

*Good morning/afternoon/evening: My name is I am a student at School of Medical Sciences, KNUST. I will be conducting several meetings with people like you in Amansie west district to find out your views and ideas about “**factors necessary to consider when one wants to implement the use of Mobile Technology for Adolescent Counselling in sexual and reproductive health**” Your opinions are highly essential at the same time vital, as they will help us to improve the kind of service we provide. Whatever you say will be treated confidential, so feel at ease to express your candid opinion. Be assured that your responses will not in any way be linked to your identity. You are kindly requested to speak your mind and do not feel intimidated or be influenced by what someone says. Kindly also allow me to record the conversations with this recorder (show it to them) – this is only to help me to document the conversations very well. The recording will be deleted as soon as it is transcribed. **THANK YOU***

Description of group: -----

Date of Discussion:-----

Section A

Mobile network infrastructural availability and cost implications for mobile phone usage of the adolescent in the rural district of Amansie West.

1. What mobile network(s) is/are available in this community and the signal strength and coverage adequate?
2. What percentage of the community members or households owns mobile phones?
3. Why do you think some people/households do not want to own phones?
4. How much do you think will cost an individual who uses a phone in a week? Is this amount affordable to most people in this community?
5. Do you think parents should buy or share their phones with their adolescent children? Discuss whether or not the group think parents would want to spend more to get their adolescent children receive advise on sexual & reproductive health on phone?

Section B

Is the use of mobile technology in adolescent sexual-reproductive health counseling culturally acceptable?

6. What are some of the adolescent sexual reproductive challenges in this community?
7. How are these challenges handled in this community?
8. Who do you think should be responsible for counseling the adolescent on sexual reproduction and why?
9. Do you think the use of modern technology (e.g. mobile phone) is appropriate / acceptable for counseling the adolescent on sexual reproduction?

i. Yes ☐ ii. No ☐ Discuss
yes Discuss No.

Section C Knowledge and interest of adolescents in mobile technology in sexual reproductive health counseling

10. Do you think adolescents in this community have knowledge and interest in the use of mobile phones? How can you prove this? (Discuss)

Section D

Government, cooperate organizations and stakeholders in mobile technology industry interest to invest in tele-health counseling?

11. Do think government, cooperate organizations and stakeholders in mobile technology industry should have interest to invest in establishment of call centers that will provide counseling and information on sexual & reproductive health issues for the adolescents? i. Yes ☐ ii. No ☐
12. Give reasons for your answer (Brainstorm & Discuss)

INTERVIEW GUIDE FOR NATIONAL STAKEHOLDERS

**KWAME NKRUAH UNIVERSITY OF SCIENCE AND TECHNOLOGY/
DEPARTMENT OF SOCIAL PHARMACY/KUMASI COLLABORATIVE CENTRE
FOR RESEARCH (KCCR)**

Research Title: Mobile Technology and Adolescent health: Assessment of feasibility and acceptability of the use of Mobile Technology for Adolescent Counselling in sexual and reproductive health in the Amansie West District

Introduction

*Good morning/afternoon/evening; My name is I am a student at School of Medical Sciences, KNUST. I will be conducting several meetings with people like you in Amansie west district to find out your views and ideas about “**factors necessary to consider when one wants to implement the use of Mobile Technology for Adolescent Counselling in sexual and reproductive health**”. However, our discussions will focus primarily on cultural acceptability of the technology. Your opinions are highly essential at the same time vital, as they will help us to improve the kind of service we provide. Whatever you say will be treated confidential, so feel at ease to express your candid opinion. Be assured that your responses will not in any way be linked to your identity. You are kindly requested to speak your mind and do not feel intimidated or be influenced by what someone says. Kindly also allow me to record the conversations with this recorder (show it to them) – this is only to help me to document the conversations very well. The recording will be deleted as soon as it is transcribed. **THANK YOU***

Interview Guide for national stakeholders

1. Discuss current national adolescent sexual-reproductive health policy 2. What is the impact of the current policy?
3. Assess the level of knowledge and interest of using mobile technologies in adolescent sexual-reproductive health.
4. Discuss whether there is interest and commitment in funding any such initiative.

Section A

Mobile network infrastructural availability and cost implications for mobile phone usage of the adolescent in the rural district of Amansie West.

1. What is the percentage of mobile phone coverage in Ghana?
2. What percentage of rural Ghana currently has mobile connectivity?
3. What is the policy of your sector on mobile connectivity for rural Ghana?

Section B

Is the use of mobile technology in adolescent sexual-reproductive health counseling culturally acceptable?

4. Will your organization consider using mobile technology as tool for adolescent counseling in sexual and reproductive health? i. Yes ☐ ii. No ☐

5. Give reason for your answer.....

.....

.....

Section C:

Interest of adolescents in mobile technology in sexual reproductive health counseling

9. What do you think will be the best mobile application for the adolescent, especially in rural Ghana? ***(Tick by ranking)***

- i. Voice calls ☐
ii. Text messaging ☐
iii. facebook ☐
iv. Email ☐
v. Google ☐
vi. Other (specify) ☐

Section D

Government, cooperate organizations and stakeholders in mobile technology industry interest to invest in tele-health counseling?

6. Will this organization be willing to support or invest mobile technology as tool for adolescent counseling in sexual and reproductive health? i. Yes ☐ ii. No ☐

10. If No, why?.....

.....

7. If yes, in what ways is your organization willing to do this?

.....

.....

THANK YOU FOR YOUR TIME

Appendix B:Map of Amansie West District

