

UNIVERSITY OF NAIROBI



SCHOOL OF COMPUTING AND INFORMATICS

**EFFECTIVENESS OF THE SHORT MESSAGING SERVICE USE ON
PEOPLE LIVING WITH HIV/AIDS FOR TREATMENT, PREVENTION
AND CONTROL IN KENYA: A CASE STUDY OF SWOP CLINIC**

BY

NELLY MUTULI NDUNDA

P54/85698/2016

SUPERVISOR

DR. STEPHEN MBURU

**A PROJECT REPORT SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIRMENTS OF THE AWARD OF THE DEGREE OF MASTER
OF SCIENCE IN INFORMATION TECHNOLOGY MANAGEMENT OF
THE UNIVERSITY OF NAIROBI**

2020

DECLARATION

STUDENT

I, the undersigned, declare that this project is my original work and that it has not been presented in any other university or institution for academic credit.

Signature.....

Date.....

NELLY MUTULI NDUNDA

P54/85698/2016

SUPERVISOR

This research project has been submitted for examination with my approval as university supervisor.

Signature.....

Date

DR. STEPHEN MBURU

SCHOOL OF COMPUTING & INFORMATICS

UNIVERSITY OF NAIROBI

DEDICATION

This research is dedicated to Blessed Virgin Mary my heavenly mother and seat of wisdom for all her intercessions and assistants she made, to my father Geoffrey though departed from this world he was a very great support to me, my mother Lillian and my siblings especially Victor and Karen for all their unwavering support throughout my study period.

ACKNOWLEDGEMENT

I thank the Almighty God for granting me with opportunity to further my studies, for all his provisions and for granting me the completion of my Research project, all glory goes back to you.

I would also like to express my sincere gratitude to my Supervisor Dr. Stephen Mburu who mentored me, for his relentless guidance and support throughout this project. I am also very grateful to Dr. Wanjiku, Dr. Miriti, and Dr. Ronge whose valuable advice and input enhanced the quality of my research project.

I would also like to thank my extended family members and friends for their continued support and patience while I was undertaking this project. I am indebted to so many people, institutions and organizations for their contribution and support towards the successful completion of this research project. It may not be possible to mention all by names but please accept my sincere appreciation and gratitude.

God Bless You All.

ABSTRACT

HIV/AIDS is a disease which has caused the loss of many lives globally especially in developing countries Kenya being one of them. Kenya is on track to achieve the global targets of zero new infections, zero Aids related deaths and zero discrimination by the year 2030. To achieve this target Kenya incorporated the use of mobile health in its hospitals which was seen as tool for treatment, prevention and control of HIV/AIDS which is a long life disease with the patients taking drugs for the rest of their life. However with even the use of mobile health, there has been slow progress of counteracting HIV/AIDS with estimation of new infections to be 52800 and 28200 deaths of Aids related sickness been reported annually in the year 2017. This research evaluated the effectiveness of mHealth initiative short message services (SMS) use on PLHIV as a tool for their treatment, prevention and control in SWOP clinic in Kenya. The research adapted health belief model (HBM) to evaluate whether its variables had an influence on effectiveness of short message services(SMS) use on PLHIV as tool for treatment, prevention and control of Aids. The research design adopted for the study was a survey research design. The population of study was PLHIV under ART and enrolled for SMS services. The instrument for data gathering used for the research was closed ended questionnaires. The sample size was 68. Simple random sampling technique was use to select a sample of 68 PLHIV at SWOP clinic. Descriptive and inferential analysis were the methods used for analysis of the data gathered. The study findings concluded that 83% of variations in effectiveness of the SMS were influenced by perceived susceptibility, perceived severity, perceived benefits, and perceived barriers, cue to action, self-efficacy, confidence, threat, cost and information. The study also recommends that there is a need for public private partnership to be established. This will help implementation of M-health initiatives as the private sector will be encouraged to heavily contribute in supporting the public sector. The research concluded that SMS is an effective tool for treatment prevention and control of HIV/AIDS.

Key Words: ART, PLHIV, mHealth, SMS, SWOP, HBM, Effectiveness.

TABLE OF CONTENTS

DECLARATION	ii
DEDICATION	iii
ACKNOWLEDGEMENT	iv
ABSTRACT	v
TABLE OF CONTENTS	vi
LIST OF TABLES	ix
LIST OF FIGURES	x
ABBREVIATIONS AND ACRONYMS	xi
CHAPTER ONE: INTRODUCTION	1
1.1 Background	1
1.2 Problem Statement	3
1.3 General Objectives	3
1.4 Specific Objectives	3
1.5 Research Questions	3
1.6 Significant of the Study	4
1.7 Scope of the Study	4
1.8 Limitations	5
1.9 Assumption for the Research	5
1.10 Definition of Terms.....	5
CHAPTER TWO: LITERATURE REVIEW	6
2.1 Introduction.....	6
2.2 HIV Prevalence in Kenya	6
2.3 Mobile Health Initiatives for HIV/AIDS Treatment, Prevention and Control around the Globe.....	9
2.4 Factors that Promote the Use of SMS Services by PLHIV	10
2.5 Theoretical Review	12
2.5.1 The Theory of Planned Behaviour (TPB).....	12
2.5.2 Health Belief Model (HBM)	13
2.5.3 Information Motivation-Behavior Skills (IMB)	15
2.5.4 Protection Motivation Theory (PMT)	17

2.6 Comparison of the Models and How They Influence or Measure Effectiveness of SMSs Use on PLHIV for Treatment, Prevention and Control	19
2.7 Conceptual Framework.....	20
2.8 Justification of the Variables Relationships between Construct Independent Variables and Mediating Variables.....	21
2.9 Definition and Operationalization of the Construct of the Construct Variables.....	23
2.10 Literature Gap	24
CHAPTER THREE: RESEARCH METHODOLOGY	25
3.1 Introduction.....	25
3.2 Research Design.....	25
3.3 Population	25
3.4 Sampling Technique	25
3.5 Sampling Size	26
3.6 Instrument	26
3.7 Data Analysis	26
3.8 Pilot Study.....	27
3.9 Validity	27
3.10 Reliability.....	27
3.11 Schedule and Budget.....	27
3.12 Ethical Consideration.....	27
CHAPTER FOUR: FINDINGS AND DISCUSIONS.....	28
4.1 Introduction.....	28
4.2 Response Rate.....	28
4.3 Pilot Test Results	28
4.3.1 Reliability Analysis.....	28
4.3.2 Validity Tests	29
4.4 Demographic Information.....	32
4.4.1 Gender of the Respondents	32
4.4.2 Age of the Respondent.....	32
4.4.3 Employment Status	33
4.4.4 Education of the Respondents.....	34

4.4.5 Whether Respondents Owned a Mobile Phone	34
4.5 Descriptive Statistics.....	35
4.5.1 Perceived Susceptibility.....	35
4.5.2 Perceived Severity	36
4.5.3 Perceived Barriers	37
4.5.4 Perceived Benefits	38
4.5.5 Cue to Action	39
4.5.6 Self-Efficacy	40
4.5.7 Threat	41
4.5.8 Cost	41
4.5.9 Information	42
4.5.10 Motivation.....	43
4.5.11 Confidence	43
4.5.12 Effectiveness	44
4.6 Inferential Statistics	45
CHAPTER FIVE: SUMMARY OF ACHIEVEMENTS, CONCLUSION AND RECOMMENDATIONS.....	48
5.1 Introduction.....	48
5.2 Summary of the Achievements.....	48
5.3 Conclusions.....	50
5.4 Recommendations.....	52
5.5 Recommendations for Further Research.....	53
REFERENCES.....	54
APPENDICES.....	57
Appendix I: Research Questionnaire	57
Appendix 2: Letter for Data Collection	63

LIST OF TABLES

Table 2.1: Comparison of the Models and how they influence or measure effectiveness of SMSs use on PLHIV	19
Table 2.2: Justification of the variables relationship	21
Table 4.1: Reliability Analysis	29
Table 4.2: Component Matrix.....	30
Table 4.3: Descriptive statistics on Perceived Susceptibility	36
Table 4.4: Descriptive statistics on Perceived Severity	37
Table 4.5: Descriptive statistics on Perceived Barriers	38
Table 4.6: Descriptive statistics on Perceived Benefits	39
Table 4.7: Descriptive statistics on Cue to Action.....	40
Table 4.8: Descriptive statistics on Self-Efficacy.....	40
Table 4.9: Descriptive statistics on Threat.....	41
Table 4.10: Descriptive statistics on Cost.....	42
Table 4.11: Descriptive statistics on Information	42
Table 4.12: Descriptive statistics on Motivation	43
Table 4.13: Descriptive statistics on Confidence.....	44
Table 4.14: Descriptive statistics on Effectiveness.....	44
Table 4.15: Model Summary	45
Table 4.16: ANOVA Test.....	45
Table 4.17: Regression Coefficients	46

LIST OF FIGURES

Figure 1: HIV Prevalence Trend for Adults (15-49 years) (National AIDS Control Council, 2018)	6
Figure 2: Adults aged 15+ living with HIV across the counties (National AIDS Control Council, 2018)	7
Figure 3: Children aged 0-14 years living with HIV across the counties, (National AIDS Control Council, 2018).....	7
Figure 4: Annual AIDS-related Deaths among Adults aged 15years and above across the Counties (National AIDS Control Council, 2018).....	8
Figure 5: Annual AIDS related amongst children aged 0-14 years across the counties (National AIDS Control Council, 2018).....	8
Figure 6: Sim card penetration in Kenya (Communication Authority of Kenya, 2019)	11
Figure 7: Map of mobile network coverage.....	12
Figure 8: The theory of planned behavior (Ajzen, 1991)	13
Figure 9: Health Belief Model (Marshall H. Becker, 1974).....	15
Figure 10: Information Motivation Behavioral Skills Model(IMB) (Fisher, Jeffrey D. Fisher, 1992).	16
Figure 11: Conceptual Framework model of the use of SMS for treatment, prevention and control of HIV/AIDS.....	20
Figure 12: Hypothesized model	25
Figure 13: Response Rate	28
Figure 14: Gender of the Respondents.....	32
Figure 15: Age of the Respondent	33
Figure 16: Employment Status of the Respondents	33
Figure 17: Education of the Respondents	34
Figure 18: Whether Respondents owned a mobile Phone	35
Figure 19: Model of effectiveness of SMS use on PLHIV for treatment, prevention and control	51

ABBREVIATIONS AND ACRONYMS

AIDs	:	Acquired Immunodeficiency Syndrome
HIV	:	Human Immunodeficiency Virus
ARV	:	Antiretroviral
PLHIV	:	People living with HIV
NACC	:	National AIDS Control Council
GOe	:	Global Observation for eHealth
PDAs	:	Personal Digital Assistants
SMS	:	Short Messaging Service
GPRS	:	General Packet Radio Service
GPS	:	Global Positioning System
ITU	:	International Telecommunication Union
ICT's	:	Information and communications technology
RCT	:	Randomized Clinical Trial
MDG	:	Millennium Development Goals
TPB	:	Theory of Planned Behavior
IMB	:	Information Motivation-Behavior Skills
PMT	:	Protection Motivation Theory
ART	:	Antiretroviral Therapy
SPSS	:	Statistical Package for Social Sciences

CHAPTER ONE: INTRODUCTION

1.1 Background

HIV/AIDS is one of the major troublesome diseases in Kenya since its first case was reported in the year 1984. Since then HIV/AIDS has claimed many lives in Kenya. Acquired Immunodeficiency Syndrome (AIDs), is a severe life threatening condition caused by the human Immunodeficiency virus (HIV). It destroys the immune system thereby interfering with power of the body of fighting the organisms which cause disease. At the present time AIDs is not curable, but once a person is found to have Aids, he or she is put on life term drugs which are called antiretroviral (ARV). These drugs work by preventing the growth of the HIV virus, hence they slow down the HIV disease (World Health Organization, 2019).

Kenya is estimated to have a population of 47.6 million people (Kenya National Bureau of Statistics, 2019) and with close to 1.5 million PLHIV nationally (National AIDS Control Council, 2018). NACC also estimated the deaths which occurred by the year 2017 to have reduced drastically to 28200 compared to the year 2010 which reported AIDs related deaths to 53900.

Kenya has put on measures for achieving the worldwide set goals of zero new infections; zero AIDs related deaths and Zero discrimination (National AIDS Control Council, 2018). To achieve this goal Kenya came up with several interventions one of which is the use of mobile technology in particular the SMS to counteract the effects of HIV on its citizens.

Mobile health or mHealth is the use of mobile devices for support medical and public health practices, like mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices (Global Observatory for eHealth, 2011). mHealth entails use and capitalization of a mobile phone's core utility of voice and short messaging service (SMS) and also greater complex functionalities and applications involving general packet radio service (GPRS), third and fourth generation mobile telecommunications (3G and 4G systems), global positioning system(GPS), and Bluetooth technology.

Mobile phone has seen tremendous growth and penetration with nearly to 95% of global population owning a mobile phone and staying in places which are under the cover 2G mobile

cellular network (ICT Facts and Figures, 2016). Kenya too has in the recent times seen tremendous growth with active mobile subscription rising to 51.0 million in third quarter at end of March 2019 from 49.5 million in the second quarter (Communication Authority of Kenya, 2019). Health sector is one of the sectors which has rapidly adopted the use of ICTs, where mobile phones are used for treatment, prevention and control, behavior education, disease monitoring of several chronic diseases.

Kenyan health sector implemented the use of mobile phones for treatment, prevention and control of HIV/AIDS. Mobile phones are used to send short text message (SMS), to the mobile phones of HIV/AIDS patient reminding them to take medication, clinic appointments, instructing them to take health diet which will help their bodies to be strong, and giving the encouraging messages which help them to have good behavior not to spread the disease. (Lester et al., 2010), did a test on the effects of sending SMS on ART adherence through a randomized clinical trial (RCT) of HIV infected adults starting ART in Kenya. PLHIV who got text through SMS intervention showed high Adherence improvements in comparison to those who didn't. The use of mobile phones to send short text messages has been seen as one of the best tool to increase adherence to ART by PLHIV and proven success (Lawrence Mbuagbaw et al, 2012; Lester et al., 2010; Shet, 2010). Mobile health technologies have been accepted in the world as means for various categories like health education & disease monitoring, (Caricia Catalani et al, 2013). Millions of lives are lost in Africa as a result of HIV/AIDs, Tuberculosis, malaria and pregnant related complications and with mhealth solutions these lives could be saved (PWC, 2013).

Access to health care is a core important support for a country's economic growth. For a country to have a health workforce results to the growth of the country's gross Domestic Product (GDP) (Munyua, S., Rotich, G., & Kimwele, 2015). For this reason Kenya has embraced SMSs services as a way to add much strength to the strategies put out for the purpose of enhancing health systems (MOH, 2011), with an aim to meet its mandate of fulfilling the millennium Development Goals (MDG).

1.2 Problem Statement

Despite NACC reporting a decline of annual number of new HIV infection to 32% and AIDs related deaths to 48% nationally (National AIDS Control Council, 2018), even with the use of mHealth, this possess great challenge for Kenya in achieving the worldwide goals of Zero new HIV infections, Zero AIDS related deaths and Zero discrimination by the year 2030. The reason for this is because the face at which HIV/AIDs disease is decreasing is very slow and if the same face continues it will claim the loss of many lives in the country as well as slowing the growth of GDP, as a health work force results to economy growth and unhealthy work force to reduction of economic growth. Therefore study aims at evaluating the effectiveness of SMS use on PLHIV for treatment, prevention and control HIV/AIDs.

1.3 General Objectives

The general objective for this research was to identify the effectiveness of using SMSs on PLHIV for treatment, prevention and control in Kenya.

1.4 Specific Objectives

- i. To establish challenges PLHIV face by use of SMSs for treatment, prevention and control of HIV/AIDs within Kenya.
- ii. To establish the advantages of SMSs use by PLHIV for treatment, prevention and control in Kenya.
- iii. To establish disadvantages of SMSs use on PLHIV for treatment, prevention and control in Kenya.

1.5 Research Questions

- i. What challenges PLHIV face in using SMSs for treatment, prevention and control of HIV/AIDs?
- ii. What are the advantages of the use of the SMSs on the PLHIV for treatment, prevention and control of HIV/AIDs?
- iii. What are the disadvantages of the use of SMSs by the PLHIV for treatment, prevention and control of HIV/AIDs?

1.6 Significant of the Study

Government of Kenya

The research will motivate the government to embrace the use of SMS and incorporate it in all the public hospital. It will act as a motivation to the government to establish necessary funds to oversee SMSs initiatives. Hence the Kenya's economy will grow as a result of healthy work force.

SMS Solution Developers

SMS developers will come up with more solutions which will have more better features and better ones than the previous ones. They will also consider the involvement of the PLHIV in the development so as to come up with applications which meet all their requirements.

Mobile Network Operators

Mobile network operators will be able to provide the architecture for implementing mHealth application by working together with mHealth solution developers.

Donors

After this study is completed, donors upon reading it, they will be motivated to fund mHealth initiatives in Kenya.

Health Care Providers

This study it's of importance to the health care providers because it shows them how through their embracing of mHealth initiative SMS, they can better serve and improve their services towards the PLHIV in Kenya. They will incorporate SMS systems in their systems for better services.

People living with HIV/AIDS

The study shall motivate those PLHIV to use mobile health particularly the use of SMSs for their treatment because is cheap.

1.7 Scope of the Study

This research focused only on the people who are HIV+ (positive) who own or have access to mobile phones and are already using SMS service as a tool for their treatment, control and

prevention of HIV/AIDs. This study mostly focused on the use SMSs through mobile phones between the health care providers and the PLHIV.

1.8 Limitations

The area of HIV/AIDS is very sensitive and as a result it was not easy to get the patients to accept to give the data required for the study due to the privacy issues and some being surveyed may decline to response honestly. The time allocated was not enough to fully carry out the research and finish.

1.9 Assumption for the Research

The researcher's assumption was that all participants were honesty and objective in providing the relevant information on the questionnaires.

1.10 Definition of Terms

Mobile health (mHealth) - Is termed as the practice of medical and public health using mobile devices, like mobile phones, patient monitoring devices, personal digital assistants(PDAs), and other wireless devices (Global Observatory for eHealth, 2011).

Effectiveness - This is described to be the level at which eyed problems are resolved.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The relevant literatures to this study was keenly studied as you can see in the sections below.

2.2 HIV Prevalence in Kenya

The HIV prevalence for adults aged 15 to 49 years trend shows that in the mid-1990s the prevalence peaked at 10-11%, and by 2006 declined to about 6%, remaining relatively stable at this level for several years with a modest decline in recent years. The HIV prevalence rate country wide in 2017 was approximately 4.9%, women at 5.2% with higher prevalence than men who were at 4.5%. The figure below show adult HIV prevalence in Kenya.

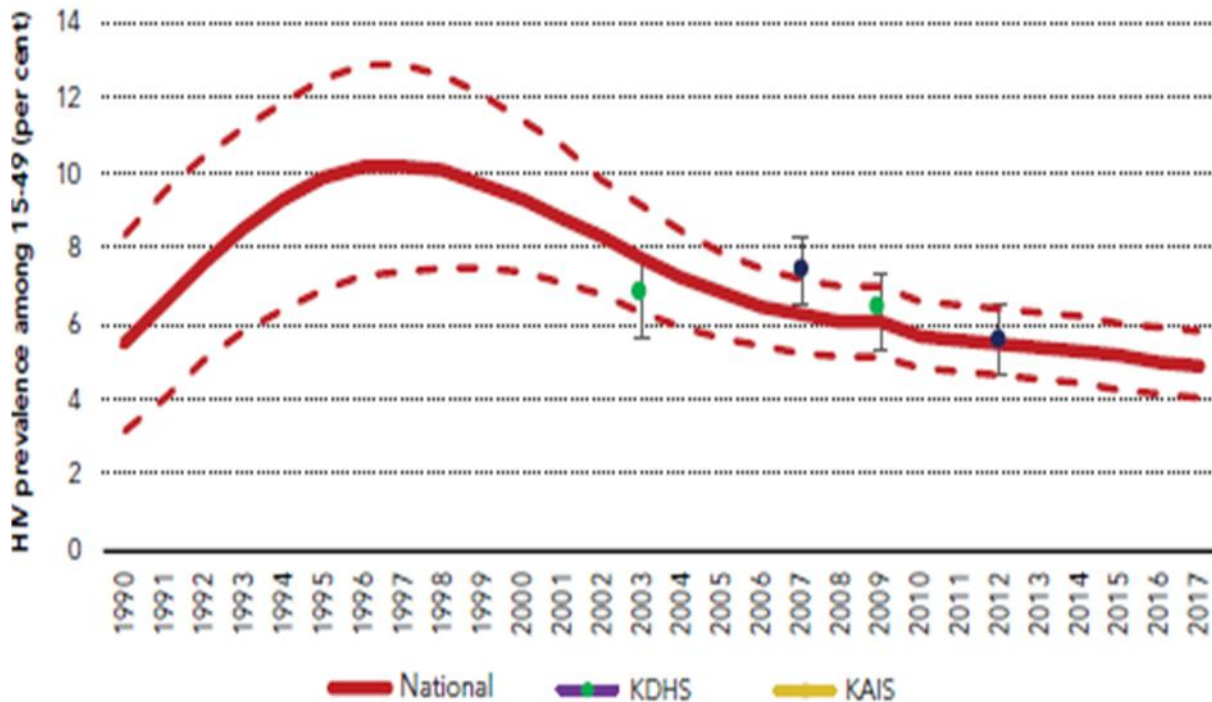


Figure 1: HIV Prevalence Trend for Adults (15-49 years) (National AIDS Control Council, 2018)

According to NACC, there were 1.3M adults with the age of 15 years and above who are infected by HIV by close of the year 2017 as seen in the diagram below.

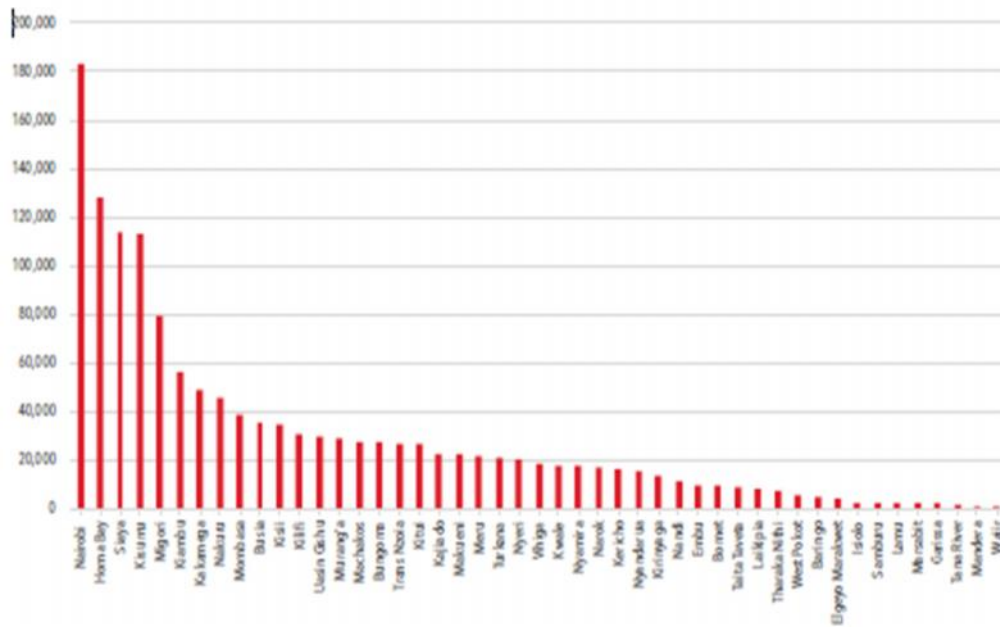


Figure 2: Adults aged 15+ living with HIV across the counties (National AIDS Control Council, 2018)

Children aged 0-14 accounted for 105,213 (6%) of the all the PLHIV in 2017, as shown in the figure below.

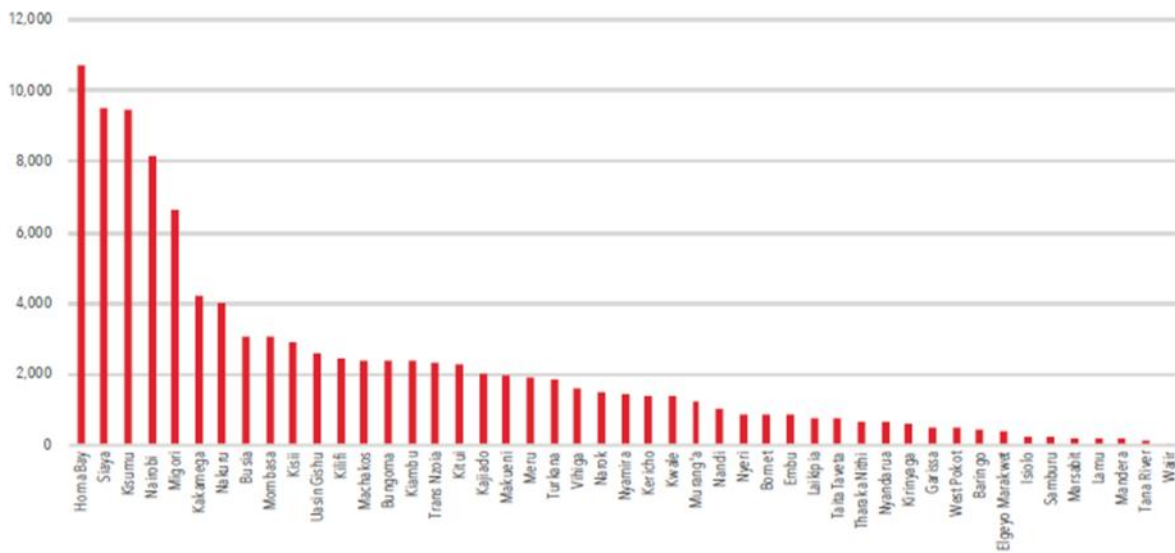


Figure 3: Children aged 0-14 years living with HIV across the counties, (National AIDS Control Council, 2018)

The AIDs- related deaths reported annual for adults aged 15 and above was 28,214 in 2017 as shown in the following figure.

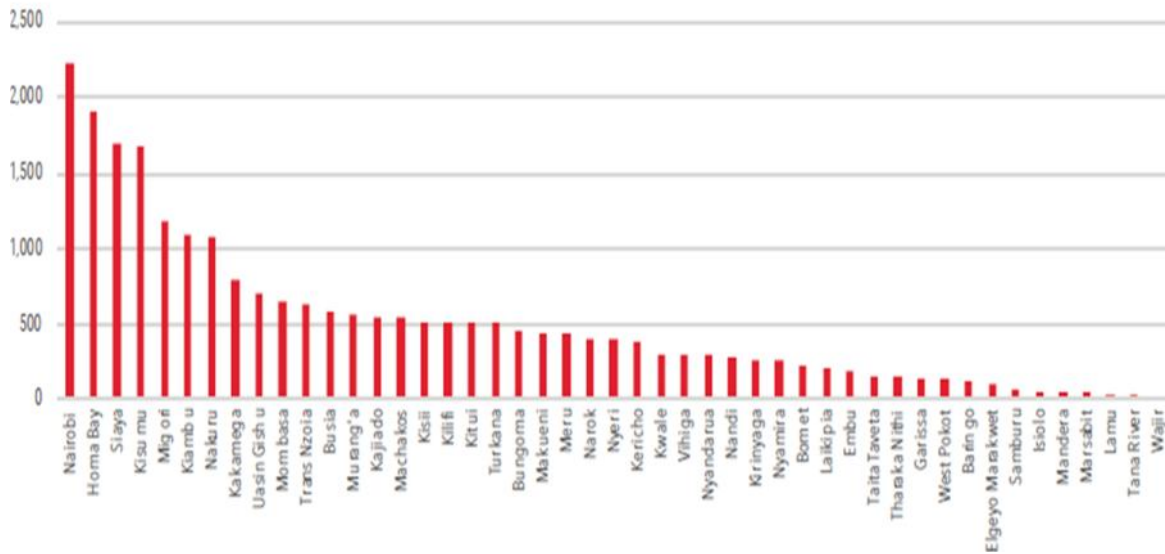


Figure 4: Annual AIDS-related Deaths among Adults aged 15years and above across the Counties (National AIDS Control Council, 2018)

Out of the annual AIDS related deaths 4312(15%) were reported to have happen among the children aged between 0-14 years as the following figure shows.

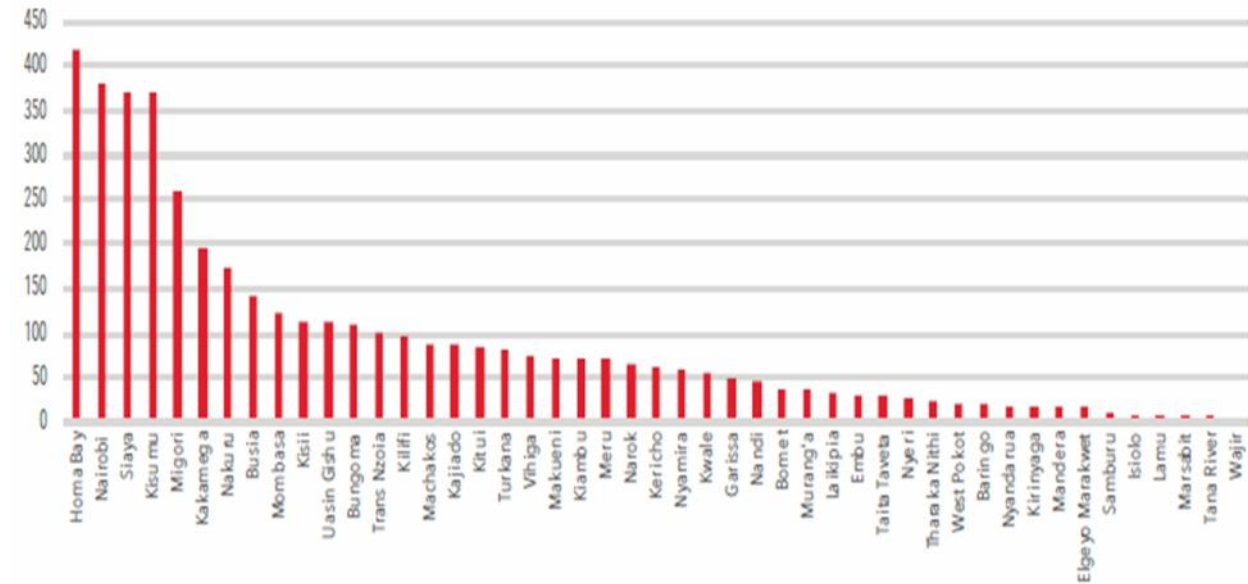


Figure 5: Annual AIDS related amongst children aged 0-14 years across the counties (National AIDS Control Council, 2018)

The new HIV infections are estimated to 52,800 annually in the year 2017 across all the ages. Adults aged 15 years and above were 44,800 while children below 14 years was estimated to be 8000 (National AIDS Control Council, 2018).

2.3 Mobile Health Initiatives for HIV/AIDS Treatment, Prevention and Control around the Globe

CAMPS-Cameroon Mobile Phone SMS Trial

CAMPS was RCT to evaluate the weekly encouraging text messages on improving adherence sent to HIV-positive adults in Cameroon. Tested the effectiveness of sending weekly motivational text sms's in mobile phone in comparison with no text messaging for improving the medication adherence, measured using a VAS (visual Analogue Scale), the number of missed doses and pharmacy refills among PLHIV over a six month duration at accredited treatment Centre of the Yaounde Central Hospital. The text messages contained a motivational message, with a reminder material. Mobile phone number was included for the patients to able to call back in case they needed help. The research found no significant effect of encouraging SMS text on pulling up adherence to ART over six month period.

WelTel Kenya1-Kenya

WelTel Kenya1 was a RCT done within Kenya to determine the effect of mobile phone text messages services on the ARV treatment adherence. WelTel Kenya1 was RCT on HIV positive adults starting their antiretroviral therapy (ART) in three different hospitals in Kenya. They were randomized (1:1) by simple randomization which had a random number creating program to a mobile phone short message service (SMS) initiative or standard care. Those enrolled for short message service got weekly SMS texts from the clinical nurses and were supposed to give respond in a period of 48hours. The results showed ART adherence of over 95% of prescribed doses in the past 30 days at both 6 and 12 month follow-up visits, and plasma HIV-1 viral RNA load reduction to below 400 copies per mL at 12 months. The first intention for the analysis was to treat. Patients who received SMS support had largely improved ART adherence and rates of viral reduction in comparison with the control patients. WELTEL Kenya1 found that the use of mobile phones to improve patient outcomes in resource limited areas could be effective.

Short Message Service Reminder – Guadeloupe

This was a study carried out to determine if the SMS text messages through a mobile phone reminding the HIV patient to attend clinics improved the clinic appointment attendants. It was carried in Mexico in a city called Guadeloupe in a Pointe-à-Pitre University Hospital. The study was carried out between March and April 2018. Those included in the study were people who were 18 years and above, were infected with HIV, they owned mobile phone and they are already registered in the hospital for ARV. Two groups were then formed, one SMS+ and another SMS-. The SMS+ group was the one to receive the appointment reminder sms through their mobile phones and the SMS- was not sent the appointment reminder sms via their mobile phones. The outcome of this study showed that SMS appointment reminder for clinical appointment had no any significant for the improvement of clinic appointment attendants. Two days earlier to the time scheduled appointments the SMSs are sent. The study found that SMS reminder sent had little influence of +3% of PLHIV in clinics.

2.4 Factors that Promote the Use of SMS Services by PLHIV

Mobile Connectivity

Mobile technology in Africa is growing fast from just a tool of communication into service delivery platforms (Aker, Jenny C., Mbiti, 2010). Sub-Sahara Africa is viewed to have poor infrastructure worldwide but has very high network cover. The network cover improvement, includes investments of 3G and 4G technology and with the expectations of getting a wireless local area network (Wi-Fi) cover, has seen the advancement of connectivity in Africa (Diop, J., & Crul, 2014). Africa has one of very large growth rates in the mobile market that is attributed to larger mobile penetration percentages and advancing of 3G compared to the advanced countries.

Mobile Penetration

Kenya's mobile market is one of highly advanced mobile eco-systems in Sub-Saharan Africa. This is mainly caused by the existence of good policy and regulatory framework which has enabled quick growth of mobile networks and which are affordable mobile services. It is approximated that at least 96% of the Kenyan population is covered by a mobile network. According to the quarterly statistic of CAK the number of mobile SIM card which were are active stood at 52.2 million by the end of June, 2019 up from the previous statistic quarterly reports of the end of March, 2019

that was 51.0 million. This translated to SIM card penetration of 109.2% (Communication Authority of Kenya, 2019). The following figure explains:

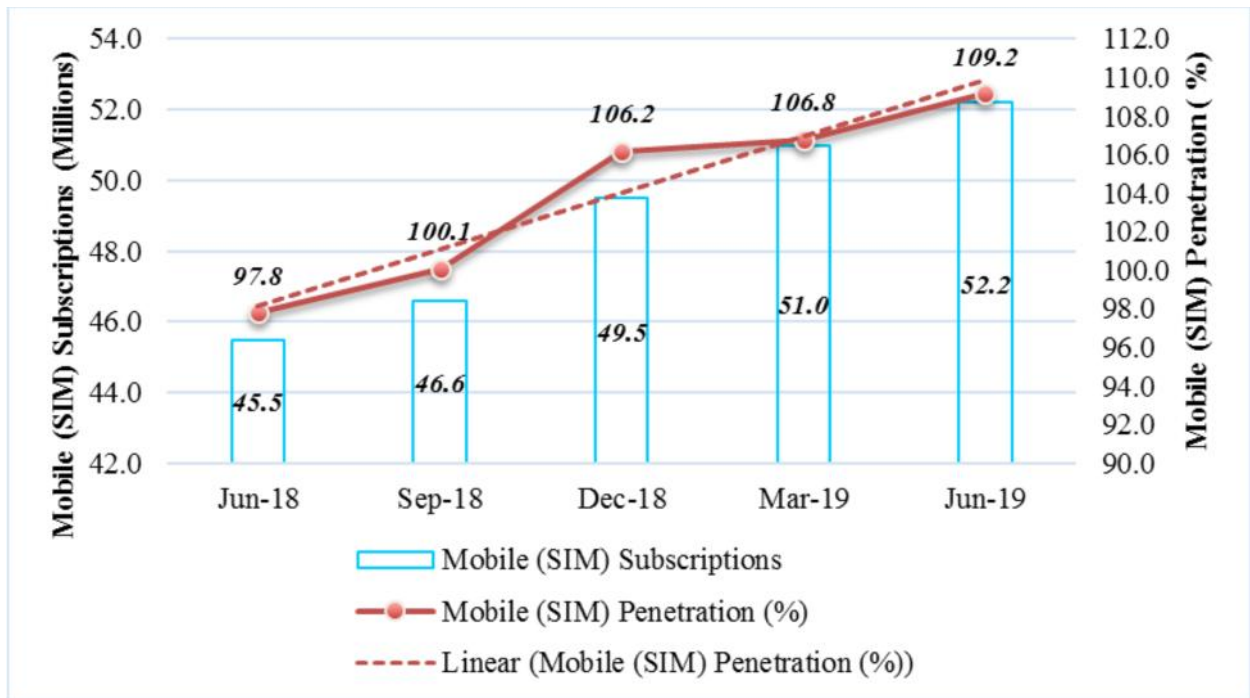


Figure 6: Sim card penetration in Kenya (Communication Authority of Kenya, 2019)

Most of mobile phone subscribers in Kenya own mobile phone handsets which are cheap and mostly use them for messaging and calling and receiving calls only. These mobile phones do not support high level multimedia applications and so text messaging is the best ideal way of incorporation of healthcare within the system.

Mobile Coverage in Kenya

Competing of mobile operators led to the growth of network coverage in rural areas which were viewed as non-economical. Countries which are developing, mobile coverage is seen to be largest in places which are hugely populated and in places which has largest economic promise which is mostly in large towns or places near major highways. Country wide coverage is about 77% of the population, which covers close to 31 million people in the country. As shown by the diagram below 38% mobile geographic in some areas of the country not yet covered mainly the arid and semi-arid areas (Malack et al., 2015).



Figure 7: Map of mobile network coverage

2.5 Theoretical Review

2.5.1 The Theory of Planned Behaviour (TPB)

TPB was developed by Icek Ajzen with aim to predict human behavior (Ajzen, 1991). TPB assumptions are, attitude toward the behavior, subjective norm, and perceived behavioral control influence behavioral intention. TPB constructs are:

a) Behavioral Intention: It's the motivational factors which influence behavior (Ajzen, 1991). The powerful is intention to participate to a given behaviour, the more likelihood it is to act on behavior.

b) Attitude: Attitude to the behavior which is describes as level in which person has a positive or negative feelings of a given behavior (Ajzen, 1991).

c) Subjective norm: It's social push to act or not to act on a given behavior. When normative beliefs and motivation to act are combined together form subjective norm (Ajzen, 1991).

d) Perceived behavioral control: Ones feelings of how its easily or no ease of doing the behaviour of interest (Ajzen, 1991).

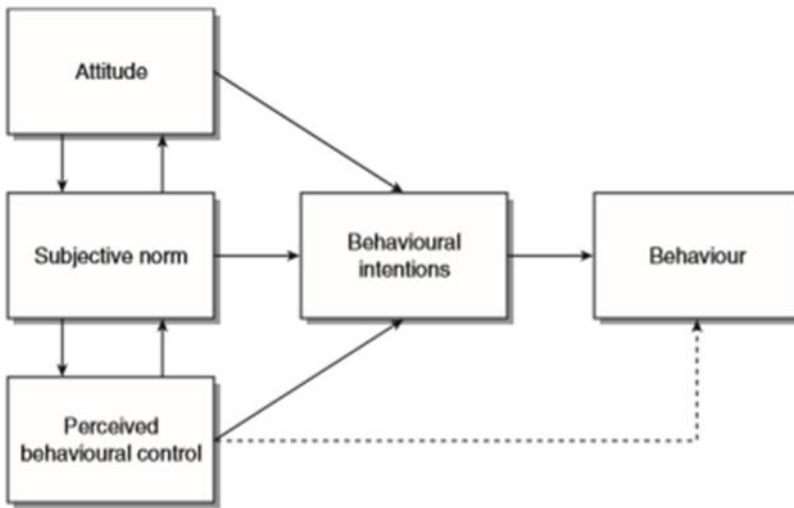


Figure 8: The theory of planned behavior (Ajzen, 1991)

2.5.2 Health Belief Model (HBM)

A social scientist in the U.S public health developed HBM in the early years of 1950's. His intention was to know why individuals did not accept disease prevention strategies or screen tests which assisted in detecting the disease earlier. HBM was afterwards used for patient response to symptoms and adherence with medicine regimes.

HBM assumes that a one's belief in self threat of an illness or disease in addition with one's belief in the effectiveness of the suggested health behavior or action will predict the likelihood that individual will accept the behavior. HBM draws from psychological and behavior theory two characteristics of health- related behavior:

The willingness to prevent illness, or to be cured if ill already.

Belief that a certain health action will block, or cure, illness. Ultimately, one's decision to action often depends on the one's views/ feelings of the benefits and barriers related to health behavior.

HBM has six construct as discussed below:

Perceived susceptibility - Defined as a one's subjective perception of how he/she is vulnerable of contracting an illness or disease (Marshall H. Becker, 1974). There is different variations to which an individual feels exposed to the illness or disease.

Perceived severity – This described of how someone persevere the seriousness of getting a disease(or not treating the disease) (Marshall H. Becker, 1974). There is different views in someone’s feelings of severity, and mostly people put into considerations medical consequences (e.g., death, disability) and social consequences (e.g., family life, social relationships) when determining the severity.

Perceived benefits - Describes people's perception of the effectiveness of different actions available to lower the threat of illness or to cure illness (Marshall H. Becker, 1974). The course of measures a one takes to prevent or cure disease depends on consideration and evaluating both perceived susceptibility and perceived benefit, in order for one to accept the suggested health action if it is seen as beneficial.

Perceived barriers - Describes person's perceptions on blocks to acting on a suggested health action (Marshall H. Becker, 1974). There is many variations in a person's feelings of barriers, or impediments, which result to a cost/benefit analysis. The person weighs the effectiveness of the actions against the perceptions that it may be highly costly, dangerous (e.g., side effects), unpleasant (e.g., painful), time-consuming, or inconvenient.

Cue to action - This is the stimulus required to trigger the decision-making process to accept a suggested health action (Marshall H. Becker, 1974).The cues are internal, for example pain in the chest, or external for example advice given others, a family member illness , newspaper article.

Self-efficacy – Described as how a person is confident in own capabilities for him/her to act on given behavior successfully (Bandura, 1977).

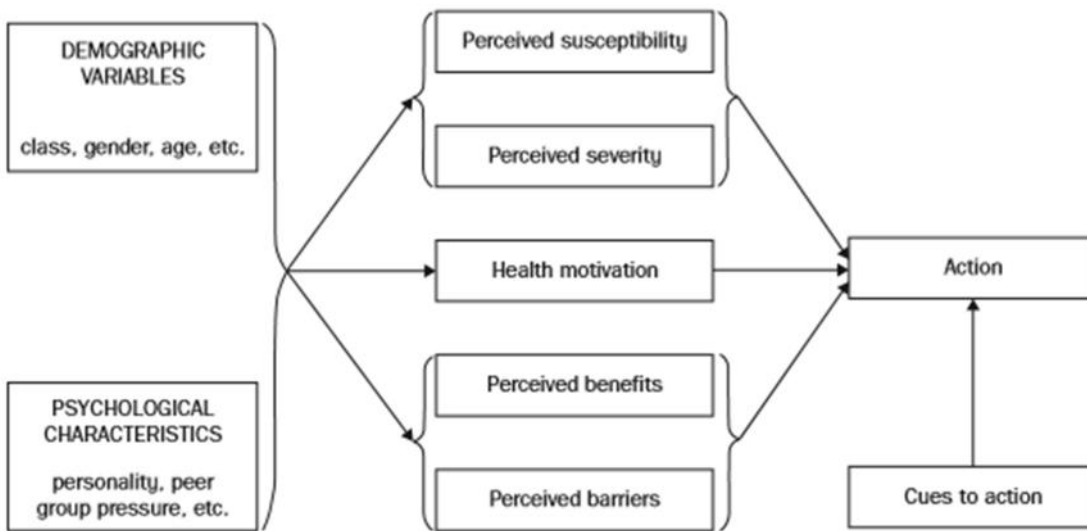


Figure 9: Health Belief Model (Marshall H. Becker, 1974)

2.5.3 Information Motivation-Behavior Skills (IMB)

IMB model is a model which is used to understand and promote health behavior (Fisher, Jeffrey D. Fisher, 1992). The model was first developed for the purpose of providing details of the psychological determinants of HIV vulnerability and preventive behaviour (Fisher, Jeffrey D. Fisher, 1992), but has since been applied in different health behavior areas.

IMB assumptions are health related information, motivation and behavioral skills are the fundamental determinants of acting on health behaviors. If someone has the right information, and for them to act is motivated, and has the necessary behavioral skills to effectively take action, will be likely to start and maintain promoted health behaviours and to have positive results for health. Likewise when someone does not possess the relevant information, unmotivated to take action, and lacks behavioral skills necessary to effectively take action, they will tend to engage in health risk behaviors and to have negative health results. The IMB model constructs include:

Information: Defined as initial prerequisite for enacting a health behavior (Fisher, Jeffrey D. Fisher, 1992). The Information may include specific truths on health promotion as well as relevant heuristics. For example, In the case of HIV prevention behavior, specific facts like Condom use prevents HIV transmission, tomorrow is the day of clinic appointment, remember to take your drugs, heuristics like, having one sex partner is safe, and implicit theories like, people who you

know and trust and dress and act well and have good morals are safe partners, they impact powerful influences on HIV preventive behavior actions.

Motivation: This puts out whether even the individual who right information will be able to carry out health suggested actions. As per the model, personal motivation (attitudes towards personal performance of the proposed health behaviors) and social motivation (social support so as to act on that proposed health behaviors) are critical influences on performance of health behavior (Fisher, Jeffrey D. Fisher, 1992; Harman, 2008). In the HIV prevention domain, for example, personal attitudes towards condom use and perceptions of social support for it are strongly predictive of condom use behavior .Personal motivation is a function of perceptions on the consequences of a behavior and evaluations of these consequences. Social motivation includes feelings that there is normative assistant on a health behavior for example families, friends, and providers of health care assist in performing of the health behavior, and being motivated to comply with others wishes (Fishbein & Ajzen, 1975).

Behavioral skills: Behavioral skill for doing a health promotion action is an addition important determinant of whether one equipped with the right information and motivated well would be in capable position to effectively carry out health promotion behavior. Behavioral skills include objective and perceived skills for doing the behaviour and self-efficacy for doing so.

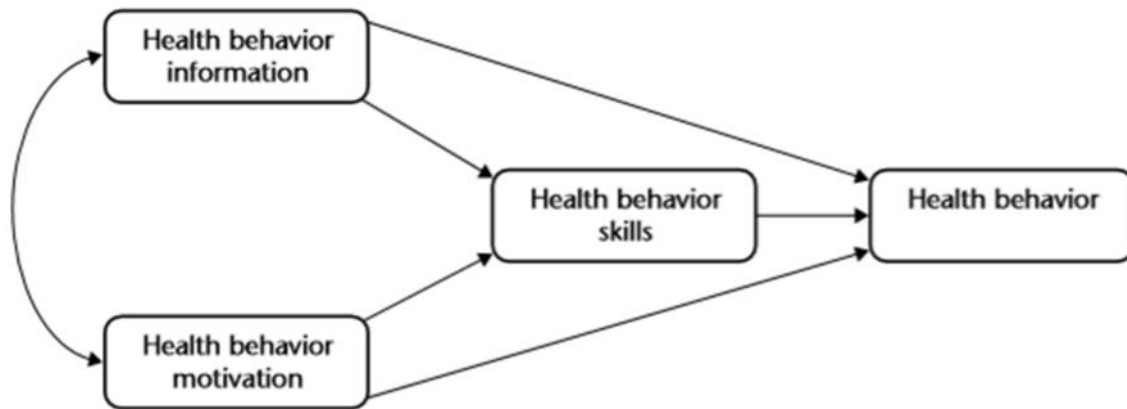


Figure 10: Information Motivation Behavioral Skills Model(IMB) (Fisher, Jeffrey D. Fisher, 1992)

2.5.4 Protection Motivation Theory (PMT)

PMT first developed in the year 1975 by Rogers, PMT suggests that people protection take actions to protect themselves based on their perceived severity of event which is threatening, perceived possibilities of occurrence, how vulnerable they are, the efficacy of the suggested preventive behaviour and perceived self-efficacy (Rogers, 1975). PMT it's concerned by how people cope with and make decisions during periods of dangers or in stressing events in life. By the decisions they take are protected oneself is protected from the viewed threats. PMT tries to give explanation and prediction of what pushes people to stop unhealthy behavior and adopt health behaviors. PMT suggests that protection encouragement originates from threat appraisal and coping appraisal.

Threat Appraisal: Explained as one's feelings of frightening by a bad event or disease (Rogers, 1975). For example, how frightened a HIV/AIDS individual whose immune system is very low is, by the possibility that may have contract a HIV/AIDS related illness. The threat appraisal, ones evaluates a number of factors that can lead to getting involved in an unhealthy behavior like missing clinic appointments and not adhering to medication. Threat appraisals are derived from Perceived vulnerability and perceived severity.

Perceived vulnerability: One's feelings of being susceptible to a disease that is a potential health threat (Rogers, 1975).

Perceived severity: is the feeling that health problem will result much consequences in a person's life life.

Fear arousal is a way of determining how much fear has come to a person due of perceived exposure and the consequences incurred. Individuals can be asked their feelings when they think of contracting diseases like HIV, cancer and so on. The levels of anxiety, worry can be used as indicators of determining the amount of fear in a person as a result of threat.

Coping Appraisal: Here one evaluates the different options that will to ensure he/she engages in a proposed action which is preventive in nature. For example, eating a balanced diet food every day. There are three groups of beliefs which include:

Response efficacy: Is believing that engagement in a given behavior will result to the reduction of the health threat (Rogers, 1975). Like not missing my medication the HIV virus will be suppressed and no threat of contracting the disease.

Self-efficacy: Belief that one possess the capabilities to take a health behavior (Bandura, 1977).

Perceived response-cost: The cost associated with performing a health behavior. (Rogers, 1975). For instance not taking my medication well may lead to me admitted in hospital.

2.6 Comparison of the Models and How They Influence or Measure Effectiveness of SMSs Use on PLHIV for Treatment, Prevention and Control

Table 2.1: Comparison of the Models and how they influence or measure effectiveness of SMSs use on PLHIV

Theory	Construct comparison	How the model influence effectiveness of SMSs for treatment prevention and control of HIV/AIDS
Theory of planned behavior(TPB)	Behavioral Intention, Attitude, Subjective norm & Perceived behavioral control. This model lacks: perceived severity and Vulnerability/ fear arousal constructs which are reflected in all the other three models. It also lacks cue of action which is reflected in the health belief model. It also lacks perceived benefits constructs which can be reflected in PMT, HBM and IMB models.	TPB assumptions is that attitude towards the behaviour, subjective norm, and perceived behavioral control influence behavioral intention, it can be used to measure effectiveness of SMSs as a means for HIV/AIDS treatment, prevention and control.
PROTECTION MOTIVATION THEORY (PMT)	Threat Appraisal Perceived severity, Perceived vulnerability & Fear arousal. Coping Appraisal Response efficacy & Self-efficacy. Lacks: Cue of action which is found in the Health Belief Model. The threat Appraisal constructs are not found in TPB and IMB but are found in the HBM.	This model explains the effectiveness SMSs for the treatment of hiv/aids through the measure of the threat appraisal, coping arousal constructs.
HEALTH BELIEF MODEL(HBM)	Perceived susceptibility, Perceived severity, Perceived benefits, Perceived barriers, Cue to action & Self-efficacy. All the construct in this model expect the Cue to Action construct they can be reflected in PMT, IMB models, expect perceived susceptibility and severity which are not found in TPB model.	HBM assumes one's the view of personal threat of disease together with a person's views in the effectiveness of the proposed new health behavior or action will tell the chances that person will accept the behavior. This explains the effectiveness of use of SMSs for HIV/AIDS treatment, prevention and control.
INFORMATION MOTIVATION-BEHAVIOUR SKILLS (IMB)	Information, Motivation & Behavioral skills All the constructs of these model are similar to the constructs of the other three models with the only missing construct being the Cue to action and threat appraisals found in HBM and PMT.	This model emphasizes on having the knowledge, the motivation to act and the behavioral skills to do a desired action hence it will explain the effectiveness of SMSs for treatment of hiv/aids.

2.7 Conceptual Framework

After reviewing of the TPB, HBM, IMB, and PMT models, the researcher found the best fit model was the Health belief model (HBM) model which was adapted for this research. The independent variables which were considered relevant to explain the effectiveness of SMS use for treatment of HIV/AIDS included; Perceived benefits, perceived barriers, Self-efficacy, cue to action, Perceived susceptibility, Perceived severity. The mediating variables were cost, confidence, information and motivation, Threat. The dependent variable was Effectiveness of SMS.

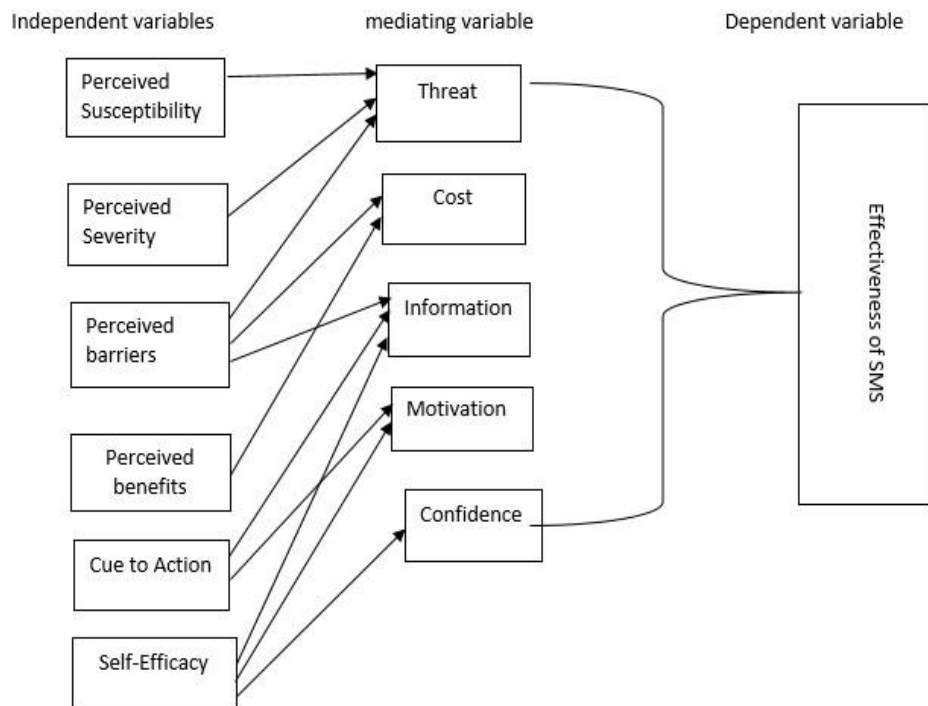


Figure 11: Conceptual Framework model of the use of SMS for treatment, prevention and control of HIV/AIDS

2.8 Justification of the Variables Relationships between Construct Independent Variables and Mediating Variables

Table 2.2: Justification of the variables relationship

Construct independent variable	Construct mediating variable	Justification
Perceived susceptibility	Threat	When people fail to have adherence to drugs, this possess a very big threat to contracting AIDS related diseases or even death, so this leads to high susceptibility whereas if they observe adherence the susceptibility is low. So a person will take the health action that is adherence to drugs in fear of the threat. When the threat is limited the perceived susceptibility is low hence the person may not take health action.
Perceived severity	Threat	When an individual think of the consequences which may occur in case of contracting a disease or the disease advancing to more serious conditions, the individual due to this threat may be inclined to take a health behavior.
Perceived Barriers		Threat may be a barrier to taking any health action. For example when one is aware of the side effects of HIV/AIDS he/she may be reluctant to drug adherence, hence threat of side effects causes a barrier to action.
	Information	The knowledge of relevant information concerning a health problem is very crucial for one to be able to take a health action. If one has no the knowledge the chances of ignoring a proposed health action are very high. Also if one has negative information concerning a proposed health action this leads to not accepting the health action.
	Cost	Before individual takes a health action one weights the cost benefit analysis. Where the financial costs are worth the benefit one will gain in acting on health action, will lead to one carrying out the health action. In case the financial costs are larger than the benefit of carrying out the health action, people will tend not to ignore the health action.
Perceived Benefits		Where the people know they will be able to benefiting in terms of costs, people will tend to shift to those things. For example by receiving sms reminders through a phone for appointment, this will reduce the cost associated with missing drug which could lead you getting worse hence using a lot of money in your treatment. Hence leads to effectiveness of using mHealth.
	Information	Information is very much relevant for an individual to carry out a health benefit. When one has a knowhow of how to carry out a certain health behavior and the

		benefits which one gets after carrying out the health behavior, this leads to a positive attitude which encourages the individual to take action.
Cue Of Action		Information from different sources like friends, media, this can trigger an individual to carry out a health action. For example if a friend tells you what are the consequences of not taking a health action this can lead to a patient accepting to take action on the proposed behavior.
	Motivation	Personal attitudes and social motivations they can influence health behavior action or lead to rejection of health behavior. Positive attitudes from the patience encourage the patient to carry out the health action. When family members always cheer their patients motivates them to desire to be cured from the sickness and hence triggers the patient to not miss the medication.
Self -Efficacy	Motivation	Motivation from family members or friends increase self-efficacy which in turn help persons to take health action. For example when family members support their HIV relative and encourage him/her to take drugs regularly this boosts the self-efficacy of this person and chance for him to miss the drugs are very few. But where motivation is low like incases of stigma to the people with HIV, the likelihood of carrying out health action or drug adherence is very low or absent.
	Information	Information which is relevant for someone to carry out a health behavior, this can lead to someone to carry out the behavior. This makes the self-efficacy in a person to be very high, and leads to action on the behavior. For example when you should use condom so as to prevent HIV transmission and know how to use it, this gives confidence to a person and they are able to use condoms. But if one has doesn't know how to condom use they will not use it and instead hoped for unsafe sex which could lead to HIV transmission. Information leads to effectiveness of SMSs, but lack of the information leads to lack of self-efficacy and it's a barrier to effectiveness of SMS use.
	Confidence	When an individual has high confidence with no fear, he has high self- efficacy. High self-confidence makes and individual to make decision to carry out health behavior. For example in case of using condom so as to prevent HIV, a confident person will be able to propose the use of condom to the partner so as to protect himself or the partner from contracting HIV/AIDS. Lack of confidence leads to shying away from using condom, hence not carrying out health behavior. Confidence can very well explain the effectiveness of SMS system.

2.9 Definition and Operationalization of the Construct of the Construct Variables

Perceived Susceptibility (X1): This is described as people's belief about contracting and illness (Marshall H. Becker, 1974). Perceived Susceptibility was operationalized as X1.

Perceived Severity (X2): This is described as individual's belief of how worse a condition and its implications can be (Marshall H. Becker, 1974). Perceived Severity was operationalized as X2.

Perceived Barriers (X3): Described as one's perceived physical and psychological costs of the proposed behavior (Marshall H. Becker, 1974). Perceived Barriers was operationalized as X3.

Perceived Benefits (X4): Described as efficacy of the health action in reduction of the health negative impacts (Marshall H. Becker, 1974). Perceived benefits are feelings of the effectiveness of proposed preventive health actions such as medication adherence, frequent testing, good diet eating in order to prevent HIV/AIDS related illness and to suppress the viral load. Perceived Benefits was operationalized as X4.

Cue to Action (X5): These are some triggers which are either internal or external and impacts a desire in a person to take an action. They are things like physical symptoms of a health condition and medial publicity, social influence like family and friends (Marshall H. Becker, 1974). Cue to action was operationalized as X5.

Self-Efficacy (X6): This is defined as the confidence or energy of someone's feelings in their own capability to handle a novel or uneasy conditions and to deal with any associated barriers or setbacks (Bandura, 1977). Self-efficacy was operationalized as X6.

Threat (X7): This refers to something frightening which may happen to someone (Rogers, 1975). Threat was operationalized as X7

Cost (X8): This refers to the benefit which I gained if it's worth the monetary valued spent for it. (Dodds et al., 1991). Cost was operationalized as X8.

Information (X9): Information refers to knowledge provided or learned about something or someone (Fisher, Jeffrey D. Fisher, 1992). Information was operationalized as X9.

Motivation (X10): This refers to Pleasures that comes out of someone pushing him/she to take a health action (Susan A. Brown and Viswanath Venkatesh, 2005). Motivation from family members or friends can increase the willingness of the person to comply in taking health action. Motivation was operationalized as X10.

Confidence (X11): This refers to the belief by that taking a specific course of action is the most effective. The belief that by taking a health action that the health problem will be reduced or removed, this give confident to individual to take that health action. Confidence was operationalized as X11.

Effectiveness (X12): This is described as the level in which the problems are solved. In HIV/AIDS related matters the patients should be able to achieve their targeted results i.e. the reduction or the suppression of the HIV virus, change behavior, and eradicate of the possibility of acquiring HIV related illness like TB. Through the use of SMSs these patients should be able to achieve these results so as to say that m-health initiative SMS is effective tool for their treatment and eradication of HIV/AIDS in Kenya. Effectiveness was operationalized as X12.

2.10 Literature Gap

With much growth of mobile penetration and use in Kenya, the health sector have embraced the use of SMSs for Treatment, prevention and control of the HIV/AIDS which is a burden disease in Kenya. Different initiatives have been developed for use in the fight of this disease amongst PLHIV but there is very little done on the evaluation on the effectiveness of those mHealth initiatives with a report done by world health Organization (WHO) showing that among its member state only 12% of them have evaluated their mHealth initiatives with the lowest number coming from developing countries which Kenya is one of them (WHO, 2011). This proves that there is need for research on evaluation of effectiveness of SMS use on PLHIV as a tool for treatment, prevention and control in Kenya. Therefore this research will seek to explain the effectiveness of using SMS for HIV/AIDSs treatment, prevention and control.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This section shows the research methodology used for the research. It includes research design, the population, sampling Technique, data collection instrument and how the data collected was analyzed and presented for the purpose of making conclusions and recommendations.

3.2 Research Design

Survey research design was adopted for the study. Survey research design is suitable when the target population is large as in my case. In the studies which seek to describe the relationships between the variables survey research design which is descriptive in nature is adopted. Data which was collected was used to test the following hypothesized model.

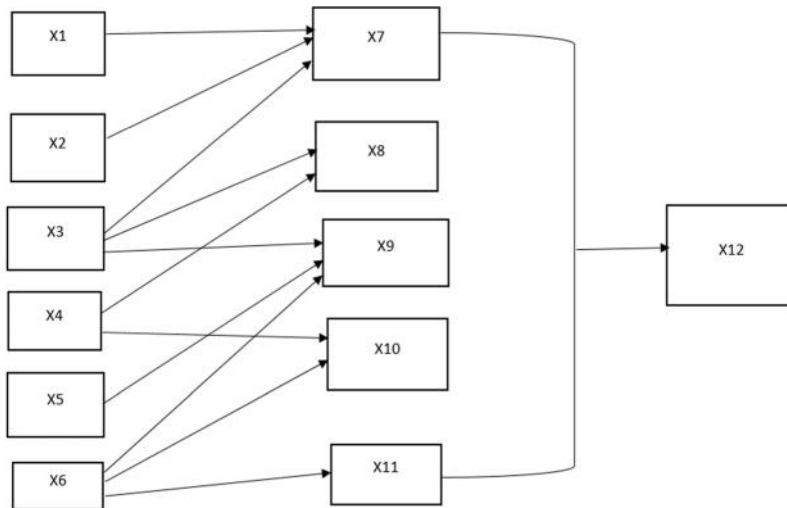


Figure 12: Hypothesized model

3.3 Population

The population which was involved in carrying out this research was PLHIV under antiretroviral drugs, owned or had access to mobile phone and enrolled to SMS services.

3.4 Sampling Technique

The technique for sampling used was for this research was Simple Random Sampling. With Simple random sampling desired presentation of the entire population is attained (Mugenda, O.M. and Mugenda, 2003). A simple random sample was an unbiased representation of a group.

3.5 Sampling Size

For sufficient sample size of the research the following parameters were put into consideration (Scott M. Smith, 2013);

Population size: The sum total of PLHIV and enrolled to SMS service.

Margin of error (Confidence Interval): Given that no perfect sample, there must be room left for error, in most cases it's a margin of error of +/-5%.

Confidence level: This was the level of reality reflected on the survey, common confidence intervals are 90% confident, 95% confident and 99% confident.

Standard of deviation: This was the rate of variance expected in the survey response, the common safe variance used was 0.5. It was considered the most forgiving and ensures a large enough sample size.

From the parameters above, the following equation was formed.

Confidence level assumption was 90%, Z-Score of 1.645, margin of error of +/-5% and a standard deviation of .5

$$\begin{aligned} \text{Size of the Sample} &= (Z\text{-Score})^2 * \text{StdDev} * (1\text{-StdDev}) / (\text{Margin of error})^2 \\ &= (1.645)^2 * 0.5(1-0.5) / (0.05)^2 \end{aligned}$$

Size of Sample = 67.650625 Approximately 68 people.

3.6 Instrument

Quantitative questionnaires were used as the instrument of choice. The questionnaires included closed questions. They were distributed to the patients for filling of the questions so as to capture the relevant data from them at SWOP clinic. The researcher used a five point Likert scale with the range of:

Strongly Disagree=1, Disagree=2, Moderate=3, Agree=4, strongly=5.

3.7 Data Analysis

Descriptive and inferential analysis were the type of data analysis adopted for the research. Statistical package for social scientist (SPSS) was used for data analysis.

3.8 Pilot Study

The researcher distributed 20 questionnaires for pilot study. Out of these 15 questionnaires were received and analysed to check if the instrument was valid and reliable.

3.9 Validity

In order to determine the construct validity of the questionnaires exploratory factor analysis was used.

3.10 Reliability

Researcher used Cronbach's Alpha method to determine each variables reliability.

3.11 Schedule and Budget

The study was a cross-sectional research. Data collection was conducted within one week only once. The budget was estimated to be KSH 3000. This amount of money was used in printing of the questionnaires.

3.12 Ethical Consideration

The participants were informed of researcher's purpose before they were requested to respond to the questionnaires. All data collected was used for scholarly work only. The researcher also requested the university permission before starting the data collection.

CHAPTER FOUR: FINDINGS AND DISCUSSIONS

4.1 Introduction

This chapter presents the analysis of data collected during the study on the effectiveness of the m-health use on PLHIV for treatment, prevention and control in Kenya.

4.2 Response Rate

The respondents were supplied with 68 questionnaires to fill in the answers. Out of these only 63 respondents had fully correctly answered the questionnaires which had a rate response of 92.6%. The rate of response was sufficient enough and in accordance to (Sekaran, U. and Bougie, 2013) who states a response rate of 50% is good for analyzing data, so rate of 92.6% very far way good.

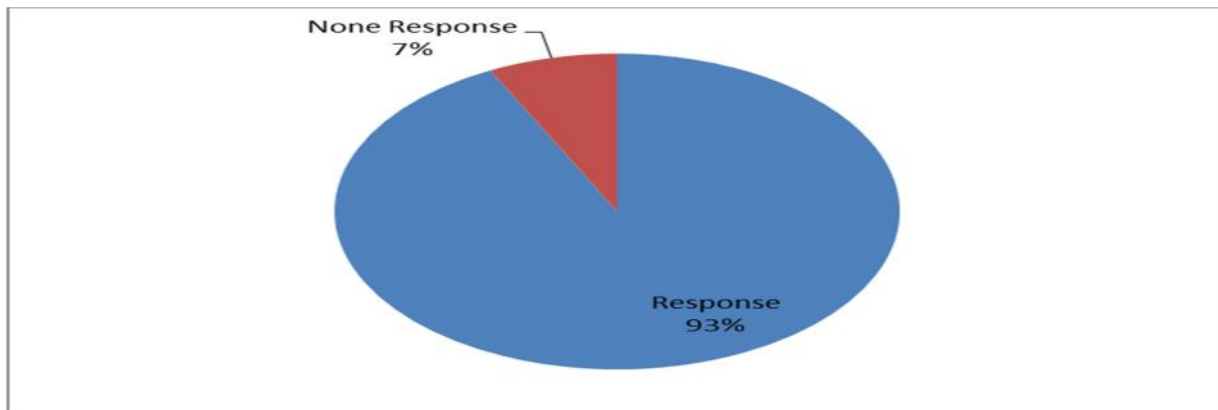


Figure 13: Response Rate

4.3 Pilot Test Results

Pilot testing was conducted to determine reliability and validity of the research instrument. Findings for the study on reliability analysis and validity tests were illustrated below.

4.3.1 Reliability Analysis

The researcher used Cronbach's Alpha method to check reliability which assumes that a number of items are available to measure behavior. The reliability coefficient was in range of 0 and 1.00; and the larger the coefficient, the more the instrument is reliable. Findings of reliability checks are shown in the Table 4.1.

Table 4.1: Reliability Analysis

	Reliability Cronbach's Alpha
Perceived Susceptibility	.897
Perceived Severity	.831
Perceived Barriers	.713
Perceived Benefits	.728
Cue to Action	.813
Self-Efficacy	.926
Threat	.871
Cost	.706
Information	.812
Motivation	.865
Confidence	.776

The findings indicated that perceived susceptibility, perceived severity, perceived barriers perceived benefits, cue to action, self-efficacy, threat, cost, information, motivation and confidence were all reliable as their Cronbach's alpha were higher than the recommended value of 0.7 therefore concluded that the instrument was reliable to capture the constructs (Valentin Rousson , Theo Gasser, 2012).

4.3.2 Validity Tests

Exploratory factor analysis was adopted to determine the questionnaire construct. The factors that explained the largest proportion of variance the variables share were expected to represent the underlying constructs.

Table 4.2: Component Matrix

	Component			
	1	2	3	4
The information I get through mobile phone from the doctors has helped me to change my sexual behaviour.	.635	.203	.104	.096
By use of mobile phones have been able to get information which has helped me always to monitor any changes in my health.	.814	.011	.091	.188
By the information I get through mobile phone from the doctors, I have the knowledge which assist me to avoid what me lead me to contract HIV/AIDS related disease.	.819	.165	.034	.044
I always seek and get information from the doctors through mobile phone when I notice unique signs or symptoms in my body which could lead to getting sick.	.724	.202	.070	.003
The information I get through mobile phones from the doctor has helped my health to improve	.915	.036	.028	.042
By getting health information from the doctors through mobile phone, HIV/AIDS has not negatively affected my life, how I see myself, my family and my daily duties	.913	.145	.034	.010
Stigma caused by HIV/AIDS reduced after embracing the health information through the mobile phones from the caregivers.	.927	.150	.098	.040
I understand the health information sent to me by health caregivers easily	.912	.101	.033	.235
I am confident the information I get through my mobile phone from health caregivers is private and confidential	.903	.295	.005	.061
I have supply of electricity; I don't miss any information sent to me because my phone is always fully charged.	.966	.092	.104	.044
I can afford the cost of receiving and sending health information to the doctors always when in need.	.890	.300	.042	.076
I don't share my phone with anybody; I am comfortable receiving information regarding my health from the care givers through my mobile phone.	.964	.041	.084	.175
The reminder information to take my medication through mobile phone from the care givers has helped me not miss my medication.	.935	.205	.015	.135
I don't miss my clinical appointments because I get alert message through my phone from the caregivers reminding me of the next appointment.	.895	.231	.179	.103
By help of health information from caregivers my viral load has suppressed or reduced.	.915	.074	.178	.139

I now eat well because of the information sent to me by health caregivers through mobile phone	.908	.046	.048	.141
The health information has encouraged me to change my bad behaviours which could worsen by condition	.133	.448	.520	.582
My family support and encourage me to always use the mobile health for my treatment	.813	.199	.139	.409
I always seek health information through my mobile phones every time I experience pain from health caregivers.	.658	.049	.014	.092
I am always motivated by information from the doctors through mobile phone to take the recommended actions towards my health	.915	.078	.194	.040
I always get health information every time I need it through my mobile phone from the health caregivers	.918	.128	.180	.159
I have trust of the information which I get through mobile phone from my caregivers	.864	.089	.087	.118
I have no difficulty when using mobile phone to seek health information from the health caregivers through my mobile phone	.919	.179	.056	.041
I use mobile health for treatment because my life is in danger	.747	.123	.081	.132
My health has deteriorated and this makes me to always make use of health information which I get through mobile phone from my health caregivers.	.919	.099	.057	.024
I no longer feel threatened by HIV/AIDS disease because by the health information sent to me from the doctors have been able to manage it.	.656	.172	.100	.317
I have always used mobile phone for getting health information irrespective of the cost.	.925	.143	.156	.122
The cost of treatment has reduced through the use of mobile health for treatment.	.161	.537	.447	.271
The cost of accessing health information through mobile phone is high	.876	.441	.047	.022

The findings in the table above allowed the determination of which variables fall under each of the 4 major factors extracted. Every of all the 29 parameters were analyzed and placed to one of the 4 factors depending on the percentage of variability it explained the total variability of each factor. From the factor analysis, all the variables showed high construct validity because they were higher than the prescribed threshold of 0.40 (Robson, 2010).

4.4 Demographic Information

The information for demographic for the research included gender, age, employment, education and whether they owned mobile phone. The purpose of demographic information was to assess the eligibility of the respondents to participate in giving data for this study. The findings were analysed and presented as shown below.

4.4.1 Gender of the Respondents

The PLHIV patients filled in answers for questions enquiring their gender. The findings were illustrated in Figure 14.

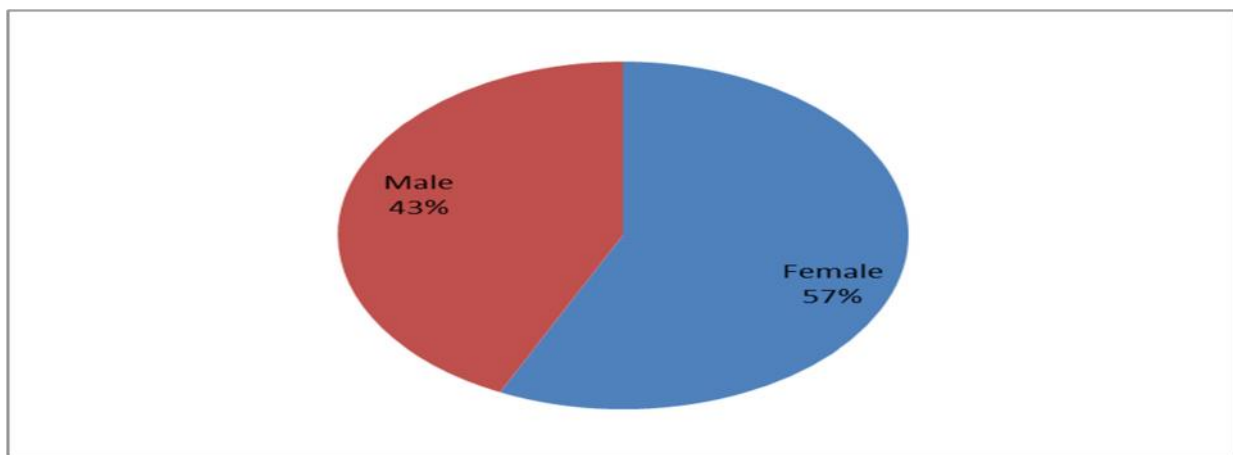


Figure 14: Gender of the Respondents

The findings showed, many of the patients were females as indicated by 57.1% and male the smaller number as indicated by 43%. The gender findings indicated that in collecting data the researcher was not gender biased. It also implies that the researcher collected data with diverse opinions since female and male respondents have different opinions on effectiveness of the use of SMS services.

4.4.2 Age of the Respondent

The respondents provided answers to the questions regarding their age. The findings were illustrated in Figure 15.

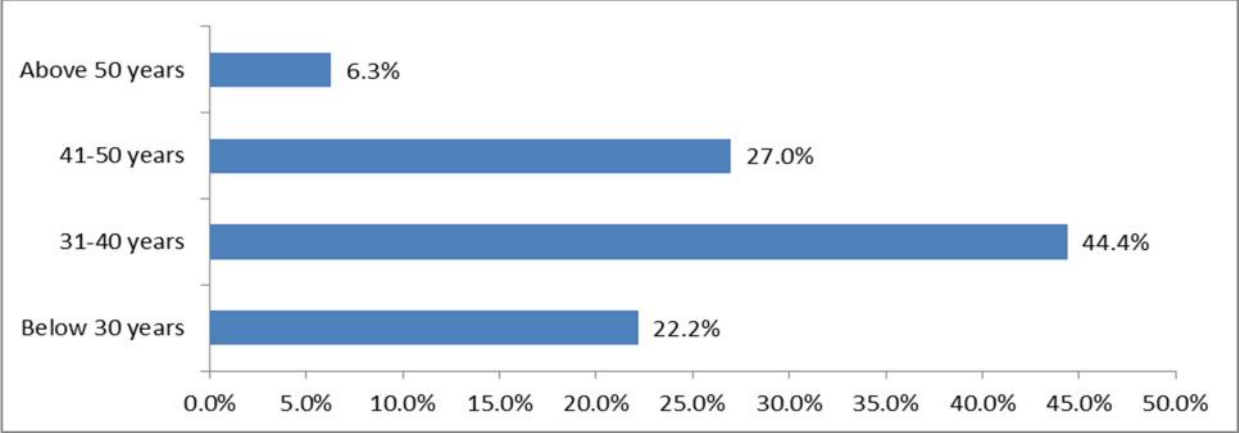


Figure 15: Age of the Respondent

From the findings, many of the respondents age was between 31 and 40 years as shown by 44.4%, 27% were aged between 41 to 50 years, 22.2% were aged below 30 years and 6.3% were above 50 years. The findings imply that the data was collected across various age groups making it more reliable to establish effectiveness of the SMS service use.

4.4.3 Employment Status

The patients provided their status in employment. The findings are as illustrated in Figure 16.

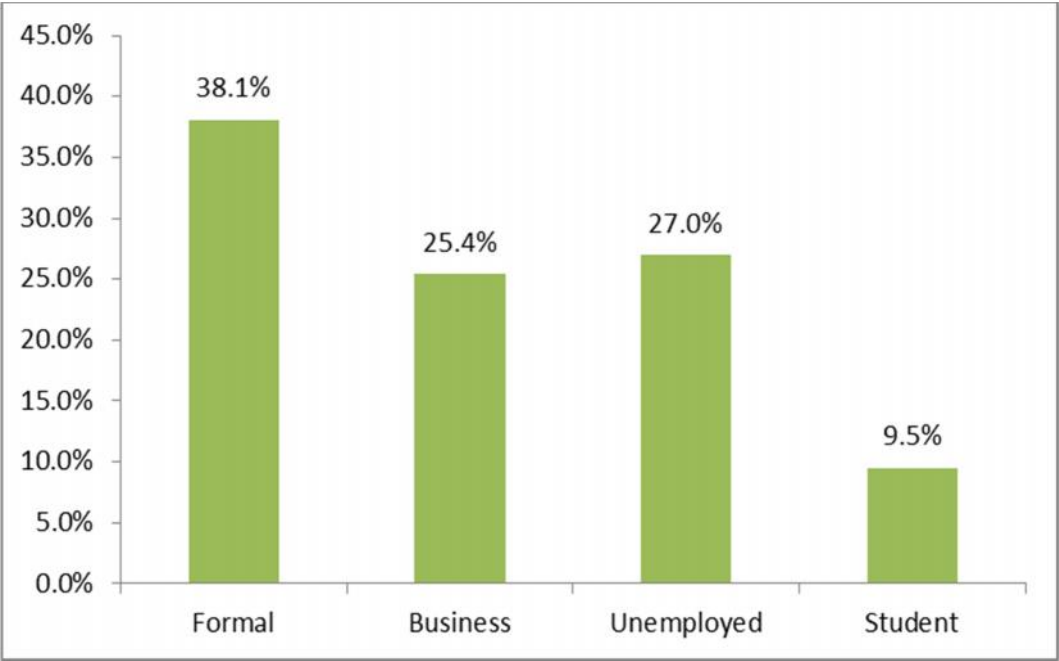


Figure 16: Employment Status of the Respondents

As per the findings, 38.1% of the respondents had formal employment, 27% were unemployed, and 25.4% had business and 9.5% students as shown in figure above.

4.4.4 Education of the Respondents

The respondents filled in questions which sought enquire on their education level. The responses were summarized in Figure 17.

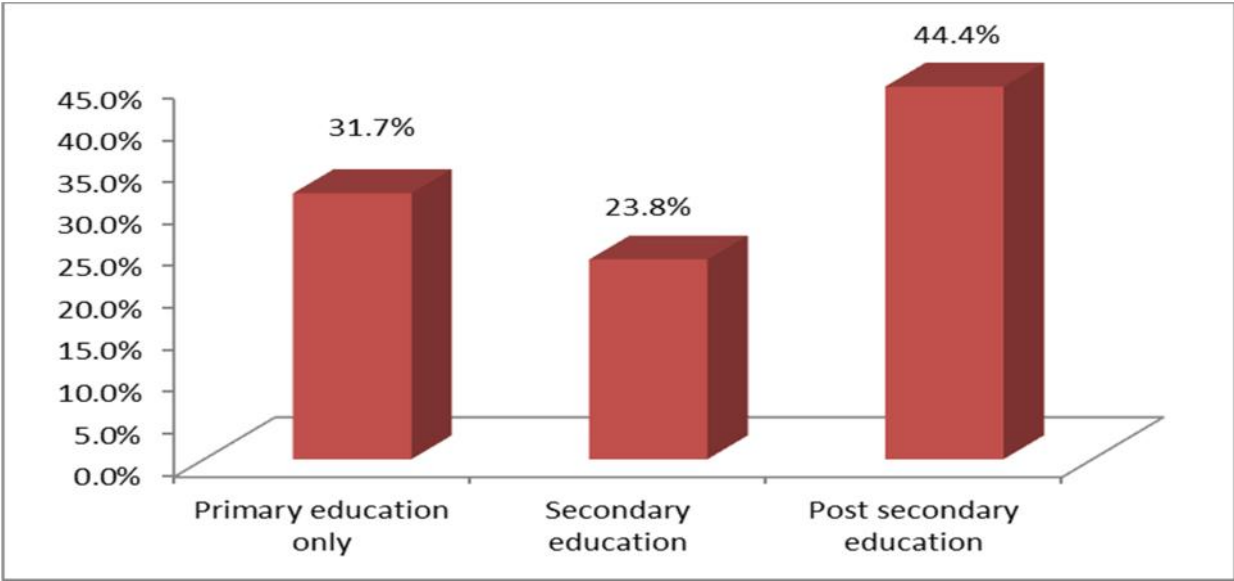


Figure 17: Education of the Respondents

From the results, 44.4% of the respondents had post-secondary education, 31.8% had primary education and 23.8% had secondary education. Most of respondents were learnt enough and could be depended upon to provide details in regards to the subject under study.

4.4.5 Whether Respondents Owned a Mobile Phone

The respondents provided details on mobile phone ownership. The findings were illustrated in Figure 18.

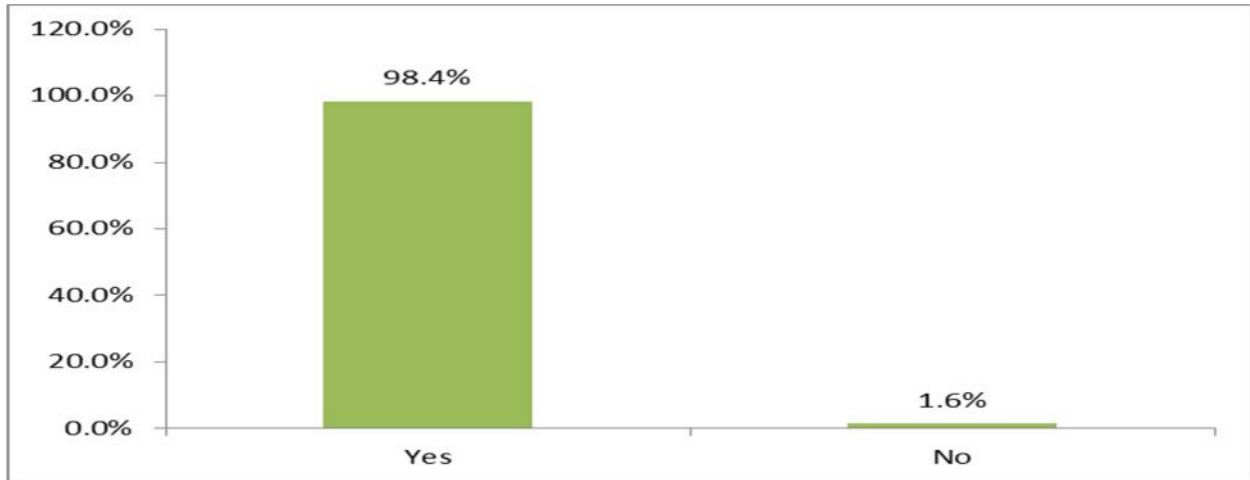


Figure 18: Whether Respondents owned a mobile Phone

As per the findings, many of the patients indicated they owned a mobile phone as shown by 98.4% and only 1.6% didn't own mobile phone. This implied that most of the respondents were in a position to give opinions on effectiveness of the use of SMS on people living with HIV/AIDs for treatment, prevention and control in Kenya.

4.5 Descriptive Statistics

The study evaluates effectiveness of the SMS use on PLHIV for treatment, prevention, control in Kenya. The descriptive statistics are presented below.

4.5.1 Perceived Susceptibility

The respondents were asked to provide answers on questions concerning their views on perceived susceptibility which sought to determine if the use of SMS services for treatment, prevention and control on the HIV/AIDS patients had reduced or not reduced the risk of contracting other HIV/AIDs related illness. The findings were illustrated in Table 4.3.

Table 4.3: Descriptive statistics on Perceived Susceptibility

	Mean	Std. Dev.
The information get through mobile phone from the doctors has helped me to change my sexual behavior.	4.365	0.655
By use of mobile phones have been able to get information which has helped me always to monitor any changes in my health.	3.587	0.944
Through the information to my mobile phone from the doctors, have the knowledge which assist me to avoid what me lead me to contract HIV/AIDS related disease.	4.032	0.822
Always seek and get information from the doctors through mobile phone when notice unique signs or symptoms in my body which could lead to getting sick.	2.191	0.780

As per findings, the patients agreed that the information they got through mobile phone from the doctors had helped them to change their sexual behavior shown by a mean of 4.365, that through the information they got through mobile phone from the doctors, they had the knowledge which assisted them to avoid what lead them to contract HIV/AIDS related disease as shown by a mean of 4.032 and that by use of mobile phones had been able to get information which helped them always to monitor any changes in their body health shown by a mean of 3.587. The patients also disagreed that they always sought and got information from the doctors through mobile phone when they noticed unique signs or symptoms in their body which could have led to be sick as shown by a mean of 2.191.

4.5.2 Perceived Severity

The patients indicate their level of support of different statements on perceived severity which sought to determine if the use of SMS service had lowered the severity or seriousness caused by HIV disease. The findings were illustrated in Table 4.4.

Table 4.4: Descriptive statistics on Perceived Severity

	Mean	Std. Dev.
The information received through mobile phone from the doctor has helped my health to improve	3.698	0.733
By getting health information from the doctors through mobile phone, HIV/AIDS has not negatively affected my life, how I see myself, my family and my daily duties	2.333	0.696
Stigma caused by HIV/AIDS reduced after embracing the health information through the mobile phones from the caregivers.	4.032	0.950

As per the findings, the respondents agreed stigma caused by HIV/AIDS reduced after embracing the health information through the mobile phones from the caregivers as illustrated by a mean of 4.032 and agreed the information they got through mobile phones from the doctor had helped their health to improve shown by a mean of 3.698. In addition, the respondents disagreed that by getting health information from the doctors through mobile phone, HIV/AIDS had not negatively affected their life, how they saw themselves, their family and their daily duties as illustrated by a mean of 2.333.

4.5.3 Perceived Barriers

The patients answered questions various statements on obstacles which the HIV/AIDS patients had in using the mobile health technology the SMS services for their treatment, prevention and control. The findings was shown in Table 4.5.

Table 4.5: Descriptive statistics on Perceived Barriers

	Mean	Std. Dev.
Understand the health information sent to me by health caregivers easily	4.571	0.614
Have trust the information i get through my mobile phone from health caregivers is private and confidential	4.302	0.835
Have supply of electricity; i don't miss any information sent to me because my phone is always fully charged.	4.556	0.996
Can afford the cost of receiving and sending health information to the doctors always when in need.	3.857	0.780
Don't share my phone with anybody; am comfortable receiving information regarding my health from the care givers through my mobile phone.	4.016	0.959

As per the results, the PLHIV patients strongly agreed that they understood information on their health sent to them by health caregivers easily as shown by a mean of 4.571 and that they had supply of electricity; strongly agreed they didn't miss any information sent to them because their phone were always fully charged shown by a mean of 4.556. The patients agreed that they had confidence in information sent through their mobile phone from health caregivers was private and confidential as shown by a mean of 4.302, agreed that they didn't share their phone with anybody; they were comfortable receiving information regarding their health from the care givers through their mobile phone as shown by a mean of 4.016 and agreed they could afford the cost of receiving and sending health information to the doctors always when need arouse as shown by a mean of 3.857.

4.5.4 Perceived Benefits

The patients filled in answers on questions on the benefits they got by using the SMS service for treatment. The findings were illustrated in Table 4.6.

Table 4.6: Descriptive statistics on Perceived Benefits

	Mean	Std. Dev.
The reminder information to take my medication through mobile phone from the care givers has helped me not miss my medication.	4.238	0.530
Don't miss my clinical appointments because of alert message through my phone from the caregivers reminding me of the next appointment.	4.556	0.857
By help of health information from caregivers my viral load has suppressed or reduced.	4.714	0.607
Now eat well because of the information sent to me by health caregivers through mobile phone	3.905	0.390
The health information has encouraged me to change my bad behaviours which could worsen by condition	4.286	0.771

As the results in the findings, the respondents strongly agreed that by help of health information from caregivers their viral load has suppressed or reduced by a mean of 4.714, strongly agreed they didn't miss their clinical appointments because of alert message through their phone reminding them of the next appointment as shown by a mean of 4.556, agreed that the health information had encouraged them to change their bad behaviors which could worsen their condition as shown by a mean of 4.286, Agreed the reminder information to take their medication through mobile phone from the care givers had helped them not miss their medication as shown by a mean of 4.238 and also agreed that they now eat well because of the information sent to them by health caregivers through mobile phone as shown by a mean of 3.905.

4.5.5 Cue to Action

The patients answered questions on cue to action which referred to what made or triggered them to take a health action. Table 4.7 shows the findings.

Table 4.7: Descriptive statistics on Cue to Action

	Mean	Std. Dev.
My family support and encourage me to always use the mobile health for my treatment	1.841	.652
Always seek health information through my mobile phones every time experience pain from health caregivers.	2.079	0.903
Am always motivated by information from the doctors through mobile phone to take the recommended actions towards my health	4.619	0.633

As per the findings, respondents strongly agreed that they were always motivated by information from the doctors through mobile phone to take the recommended actions towards their health shown by a mean of 4.619. The patients disagreed that they always sought health information through their mobile phones every time they experienced pain from health caregivers as shown by a mean of 2.0794 and that their family supported and encouraged them to always use the mobile health for their treatment as shown by a mean of 1.841.

4.5.6 Self-Efficacy

The respondents answered questions in regard to Self-Efficacy refers to patient's confidence in ability to successfully perform a behavior. The findings were illustrated in Table 4.8.

Table 4.8: Descriptive statistics on Self-Efficacy

	Mean	Std. Dev.
Always get health information every time need it through my mobile phone from the health caregivers	2.730	0.865
Have trust of the information which got through mobile phone from my caregivers	4.032	0.822
Have no difficulty when using mobile phone to seek health information from the health caregivers through my mobile phone	4.603	0.685

From the findings, the patients strongly agreed have no difficulty when using mobile phone to seek health information from the health caregivers through their mobile phone which is indicated by a

mean of 4.603. The patients agreed they had trust on information which they got through mobile phone from their caregivers as shown by a mean of 4.032. The respondents were also moderate that they always got health information every time they needed it through their mobile phone from the health caregivers as shown by a mean of 2.730.

4.5.7 Threat

The respondents requested response to questions on threat which referred to something frightening which might happen to someone. The findings were illustrated in Table 4.9.

Table 4.9: Descriptive statistics on Threat

	Mean	Std. Dev.
Use mobile health for treatment because my life is in danger	1.984	0.707
My health has deteriorated and this makes me to always make use of health information through mobile phone from my health caregivers.	4.524	0.669
No longer feel threatened by HIV/AIDS disease because by the health information sent to me from the doctors have been able to manage it.	2.064	0.669

From the findings, the respondents strongly agreed that their health had deteriorated and this made them to always make use of health information which they get through mobile phone from their health caregivers shown by a mean of 4.524. The patients disagreed they no longer felt threatened by HIV/AIDS disease because by the health information sent to them by the doctors were able to manage it as shown by a mean of 2.064 and disagreed that they used mobile health for treatment because their life was in danger as shown by a mean of 1.984.

4.5.8 Cost

The patients answered to the questionnaires concerning cost which referred to cognitive trade-off between the perceived benefits of the SMSs and the monetary cost of using it. The findings were illustrated in Table 4.10.

Table 4.10: Descriptive statistics on Cost

	Mean	Std. Dev.
Always use mobile phone for accessing health information irrespective of the cost.	3.032	0.740
The cost of treatment has reduced through the use of mobile health for treatment.	4.556	0.590
The cost of accessing health information through mobile phone is high	1.794	0.765

According to results of findings, the patients strongly agreed the cost of treatment reduced through the use of mobile health as illustrated by a mean of 4.556 but were moderate that they always use mobile phone for accessing health information irrespective of the cost as illustrated by a mean of 3.032. The patients disagreed cost of accessing health information through mobile phone was high as illustrated by a mean of 1.793.

4.5.9 Information

The respondents filed in their answers on questions on information which referred to the knowledge provided or learned about something. The findings were illustrated in Table 4.11.

Table 4.11: Descriptive statistics on Information

	Mean	Std. Dev.
Clearly understand the health information which I get through my mobile phone	3.921	0.848
Have full knowledge of status of my sickness and able to address the complications because of the health information which I get from my health caregivers through my phone.	3.174	0.871
The health information through my mobile phone has helped me to protect myself from other HIV/AIDS related diseases	4.064	0.780

From the findings, the respondents agreed that the health information through their mobile phone had helped them to protect themselves from other HIV/AIDS related diseases shown by a mean of 4.064 ,agreed they clearly understood the health information which they received as shown by a

mean of 3.921. The respondents were moderate that they had full knowledge of status of their sickness and able to address the complications because of the health information which they had received from their health caregivers through their phone as shown by a mean of 3.174.

4.5.10 Motivation

The patients were requested to indicate answers to various statements on motivation which referred to what comes out of an individual pushing him or her to take an action. The findings were illustrated in Table 4.12.

Table 4.12: Descriptive statistics on Motivation

	Mean	Std. Dev.
The access of health information through mobile phones is cheap and this motivates me always to use mobile health for my treatment	4.810	0.435
It is faster to access health information through mobile phone and this motivates me to use mobile phones for my treatment	3.016	0.729

The patients strongly agreed access of health information through mobile phone was cheap and this motivated them to use mobile phones for their treatment as shown by a mean of 4.81 and Agreed was faster to access health through mobile and this motivated them to it for treatment as shown by a mean of 3.016.

4.5.11 Confidence

The respondents to provide answers on questions concerning their confidence which referred to the state of being certain that by taking a course of action was correct or the most effective. The findings were illustrated in Table 4.13.

Table 4.13: Descriptive statistics on Confidence

	Mean	Std. Dev.
Have confidence that the health information i get through my mobile phone from the doctors will help to improve my health	4.397	0.661
Have full confidence on the health information i receive through my mobile phone from the health caregivers.	3.810	0.780

From the findings, the respondents agreed they had confidence the health information they received via mobile phone from the doctors helped improve their health as shown by a mean of 4.397 and agreed that they had full confidence on the health information received through their mobile phone from the health caregivers as shown by a mean of 3.810.

4.5.12 Effectiveness

The PLHIV patients filled in answers to questions on effectiveness which referred to the extent to which targeted problem was resolved. The findings were illustrated in Table 4.14.

Table 4.14: Descriptive statistics on Effectiveness

	Mean	Std. Dev.
I use mobile phone to get health information because its accuracy	3.318	0.758
I use mobile phone to get information because have trust in the information from the health caregivers	4.270	0.628
Will strongly recommend the use of mobile health for treatment to others	3.730	0.447
The viral load have suppressed	4.698	0.663
My overall health is very good now	4.571	0.640

From the findings, the patients strongly agreed viral load had suppressed shown by a mean of 4.698, strongly agreed their overall health was good now shown by a mean of 4.571. The respondents agreed they used mobile phone to get information because they trust the information they received from the health caregivers shown by a mean of 4.270, agreed they would strongly recommend the use of mobile health for treatment to others as shown by a mean of 3.730, were

moderate that the used mobile phone to get health information because it was accurate by a mean of 3.318.

4.6 Inferential Statistics

Multiple regression analysis was done to test the relationship between the variables. The relationship test of the variables explained how the dependent variable was influenced by the independent variables. The findings are in Table 4.15, 4.16, 4.17.

Table 4.15: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error
1	0.926	0.857	0.830	0.557

From the findings, the independent variables were statistically significant predicting the dependent variable since adjusted R square was 0.83. This implied that 83% variations in effectiveness of m-health use were explained by perceived susceptibility, perceived severity, perceived barriers, perceived benefits, cue to action, self-efficacy, threat, cost, information, motivation and confidence. Other factors influencing effectiveness of the SMS use that were not involved in the study accounted for 17% which should be studied further.

Table 4.16: ANOVA Test

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	113.507	10	11.351	31.220	.000
1	Residual	18.906	52	0.364		
	Total	132.413	62			

As per ANOVA Table, p-value was 0.000 and F-calculated was 31.220. Since p-value was lower than 0.05 and the F-calculated was larger than F-critical (2.4194), then the regression relationship was significant in how various factors affects effectiveness of the use of SMS service.

Table 4.17: Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	4.864	.866		5.616	.000
Perceived Susceptibility	0.812	0.321	0.714	2.530	.014
Perceived Severity	0.712	0.278	0.611	2.561	.013
Perceived Barriers	0.568	0.208	0.462	2.731	.007
Perceived Benefits	0.771	0.312	0.672	2.471	.016
1 Cue to Action	0.882	0.352	0.913	2.506	.014
Self-Efficacy	0.633	0.281	0.717	2.253	.026
Threat	0.799	0.196	0.834	4.077	.000
Cost	0.713	0.233	0.738	3.060	.003
Information	0.718	0.239	0.656	3.004	.004
Motivation	0.743	0.293	0.712	2.536	.014
Confidence	0.419	0.144	0.397	2.910	.005

The results presented also showed that increase in the Perceived Susceptibility led to 0.812 increases in the score of effectiveness of the SMS use, when all other variables were held constant. This variable was significant since 0.014 is lower than 0.05.

Also it was found that if perceived severity increases, there is a 0.712 increase in effectiveness of the use of SMS and this variable was significant since 0.013 was lower than 0.05. Again, the results revealed, a unit increase in the scores of perceived barriers led to 0.568 increase in the score of effectiveness of the SMS use and this variable was significant because 0.007 was lower than 0.05.

The study also found a unit increase in the score of perceived benefits led to a 0.771 increase in the scores of effectiveness of the SMS use and this variable was significant because 0.00 was lower than 0.016. The findings also indicated that taking all other independent variables at zero, a unit increase in the cue to action led to a 0.882 increase in the score of effectiveness of the SMS use and this variable was significant as the p-value 0.014 was lower than 0.05.

The findings also showed that a unit increase in the score of self-efficacy would lead to a 0.633 increase in the score of effectiveness of the SMS use and this variable was significant since 0.026 lower than 0.05. Further, the findings show that a unit increase in the score of threat would lead to a 0.799 significant increase in the score of effectiveness of the use SMS as p-value 0.000 was lower than 0.05.

The research also found with a unit increase in the score of cost would significantly lead to a 0.713 increase in the score of effectiveness of the SMS use since p-value (0.003) was lower than 0.05. A unit increase in the score of information would significantly lead to a 0.718 increase in the score of effectiveness of the SMS use because p-value (0.004) was below 0.05. The study also showed increase in motivation and confidence led to 0.743 and 0.419 increases in effectiveness of the use SMS respectively.

CHAPTER FIVE: SUMMARY OF ACHIEVEMENTS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The chapter puts out the accomplishments of the study in regards to the research objectives, conclusions and recommendations for further studies.

5.2 Summary of the Achievements

The research questions for study were useful in evaluating the achievements of the study objectives. The researcher sought to answer the following research questions.

- i. What are the challenges faced by the PLHIV in the use of SMSs for treatment, prevention and control of HIV/AIDS?
- ii. What are the advantages of the use of the SMSs on the PLHIV for treatment, prevention and control of HIV/AIDS?
- iii. What are the disadvantages of the use of SMSs by the PLHIV for treatment, prevention and control of HIV/AIDS?

First research question sought establish the challenges faced by PLHIV by use of SMS was answered through the assessment of the findings on variables perceived barriers, cost and self-efficacy as explained below.

According to the findings the respondents strongly agreed they well understood the health information from their doctors which was attributed by the fact that majority of them have post-secondary educated and were able to read and write in both Kiswahili and English. The respondents agreed that they had confidence and trust to the health information they got from their caregivers this factor was attributed to the fact that they didn't share their mobile phones and their health details was not exposed and trusted the doctors could not expose it too. The respondents also strongly agreed they had electricity connections in their residence areas so their phones always were charged and they did not miss any information due to lack of charge in phones. The respondents strongly agreed that they were at ease in using their mobiles without any difficulty.

However majority of the respondents were moderate that they sought health information from doctors every time they needed it, this was attributed by the fact that the system was only one way system whereby the doctors were the only ones to send health information to the patient. The respondents strongly agreed that SMS was cheap and as a result it had lowered their cost of treatment. This study therefore established that the challenge faced by PLHIV in using the SMSs for their treatment, prevention and control was lack of the patient not been able to reply messages to the doctors. This was shown in tables 4.5, 4.8, 4.10.

The second research question was to determine the advantages of the use of SMSs on PLHIV as a tool for their treatment, prevention and control. This research question was answered through the assessment of findings on variables perceived benefits, cost, cue to action, information and motivation as explained below.

According to the results the patients strongly agreed that they didn't miss their medications due to the reminder messages send to them by the doctors hence their drug adherence improved and this led to their viral load suppression. The respondents also agreed that they didn't miss their clinical appointments thanks to the alert messages they got from their doctors. The respondents agreed that through the health information they received through their mobile phones from the doctors, they stopped bad or risk behaviours which contributed or could contribute to contracting hiv/aids related sickness like Tuberculosis. The respondents acknowledged that as they received health messages educating them to health eat healthily, they have changed their unhealthy eating to healthy eating to as to boost their immune system. The patients agreed that they were now knowledgeable about their disease status, how to handle it and how to protect themselves from contracting other diseases related to their Hiv/aids which could worsen their health. The respondents strongly agreed that the cost of accessing treatment was not high but cheap, this attributed to that fact that for them to receive the health information they did pay any amount of money it was free of cost and hence it had reduced the cost of treatment. The cheap cost the fast of accessing health information was seen as a motivation for the patients in using SMSs for their treatment and many agreed they would recommend it to other patients who did not use SMSs as a tool for their treatment. The respondents strongly agreed that the motivation they got from their doctors helped them to follow and do as instructed in the messages they received from doctors. This study established the advantages of

using SMSs on PLHIV as a tool of treatment, prevention and control to be that it is cheap, drug adherence was improved, patient's viral load was reduced, patients clinical attendance improved, patients changed behavior, patients had increased knowledge on their disease condition and how to manage. This was illustrated in tables 4.6, 4.7, 4.10, 4.11 and 4.12.

The third Research question for the study was to establish the disadvantages of using mHealth on PLHIV as a tool for their treatment, prevention and control. This research question was answered through the assessment of the findings of the variable cost, perceived barriers and perceived Susceptibility as explained below.

According to findings the respondents agreed the cost of treatment had reduced, this was attributed by the fact that they received health information regarding their treatment free of cost. The respondents agree that they clearly understood the health information send to them by the doctors, this was linked the fact that majority of the respondents were educated past primary level, the respondents felt secure to receive health information from doctors because they never shared their mobile phones and were at ease of using mobile phones to get health information, they were well connected with electricity and this enhanced them not miss any health information from doctors due to lack of charged phones. However the respondents disagreed when asked if they sought assistant from doctors through message when they felt unwell or noticed unique symptoms or signs, this was caused by the fact that the SMS m-health initiative system was a one way, whereby only the doctors or the caregivers would send the messages but the patients would not reply or send message to the doctors, as shown in Table 4.3. Therefore the only disadvantage of using the SMS system was the fact that, the patients would not send or reply messages to the doctors.

5.3 Conclusions

From the findings, the researcher established that the use of SMSs on PLHIV as tool for their treatment, prevention and control was indeed effective and beneficial. From the findings the patients after embracing the use of SMS mHealth initiative, where they received health information from the doctor they changed the unhealthy or bad behavior which were putting them to the risk of contracting other HIV/AIDs related diseases and also transmitting the disease to others. They were equipped with knowledge of how they can health eat in order to boost the body immunity,

which they practiced. The PLHIV through the health information they could well monitor the body and go to hospital in case they noticed any unhealthy or unique symptoms to their body. From the findings the drug adherence and clinical attendance had largely improved because of the reminder massaged which they received from their doctors. The cost of treatment had greatly reduced and the stigma related issues were reduced.

However from the findings one disadvantage of the SMS system was established that it has been a one way system where the doctor could send messages to the patients and the patients would not send the messages to the doctors. This was a challenge to the patients whenever they got sick and needed agent help from the doctors.

The study concluded that 83% variations in effectiveness of the SMS use was explained by perceived susceptibility, perceived severity, perceived barriers, perceived benefits, cue to action, self-efficacy, threat, cost, information, motivation and confidence. These factors were established to significantly impact on effectiveness of the use of m-health. The researcher came up with the following model as the final product.

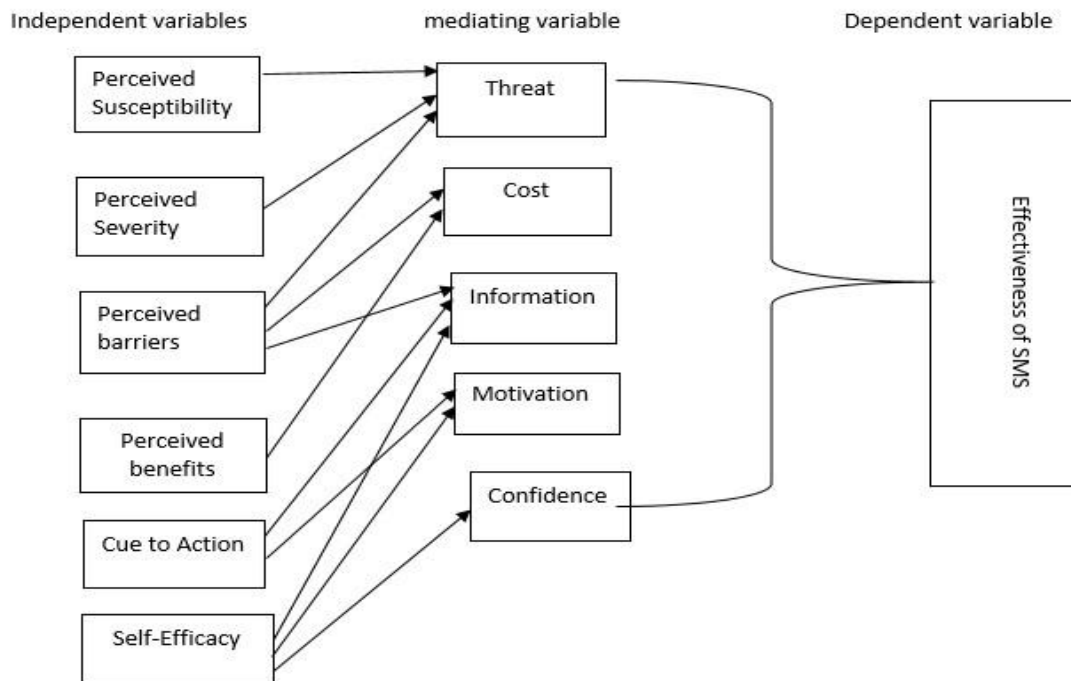


Figure 19: Model of effectiveness of SMS use on PLHIV for treatment, prevention and control

5.4 Recommendations

This study recommended ministry of health officials to conduct awareness programs to enlighten the citizens on the need to effectively use information provided by m-health initiatives like the SMS services. This will ensure that the people living with HIV/AIDs have up to date information regarding their HIV/AIDs status treatment and how to control it.

The study also recommends that there is a need for more public private partnership than what is currently there to be established. This will help implementation of SMS systems as the private sector will be encouraged to heavily contribute in supporting the public sector.

The study recommends that there is need for involvement of healthcare professional of all cadres in the various phases of SMS mhealth initiative implementation. This will help in coming up with systems which meet the requirements needed for HIV/AIDs treatment, prevention and control in Kenya.

The study also recommends the need for involvement of PLHIV in development of SMS mHealth solution projects from beginning to the end. This includes idea conception, design, solution development, testing and deployment of the SMS mHealth initiative. This will ensure that all the requirements of the PLHIV are captured and included in the SMS system.

The researcher recommends that the government need to avail more financial resources so as to support SMS m-health providers in coming up with better systems which meet the requirements of the patients and also the health professionals.

The government should also equip the facilities with modern means of communication. For example, the government can use high speed internet and install it to every hospital so that it can be used to communicate to patients via social media platforms.

5.5 Recommendations for Further Research

Researcher recommends future research should focus to a wider scope by including several other hospitals across the country to determine the true picture and effectiveness of SMS use on PLHIV as a tool for treatment.

As the researcher used a closed- ended questionnaire, the method could not have adequately captured deep underlying issues of SMS as a means for HIV/AIDS treatment, therefore the researcher proposes the use of open-ended questionnaires method to carry out depth evaluation of the effectiveness of SMS as tool for HIV/AIDS treatment, prevention and control in Kenya.

Future researchers can also conduct research on the effectiveness of SMS use by the medical practitioners and how this technology would enhance their work and the quality of healthcare they provide.

REFERENCES

- Ajzen, I. (1991). The theory of planned behavior, *Organizational Behavior and Human Decision Processes*. Elsevier, Volume 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T).
- Aker, Jenny C., Mbiti, I. M. (2010). Mobile Phones and Economic Development in Africa. *Journal of Economic Perspectives*, 24(3), 207-32). <https://www.aeaweb.org/articles?id=10.1257/jep.24.3.207>
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*. American Psychological Association, 84(2), 191–215. <https://psycnet.apa.org/record/1977-25733-001>
- Caricia Catalani et al. (2013). mHealth for HIV Treatment & Prevention: A Systematic Review of the Literature. *Open AIDS*, 7(13), 17–41. <https://pubmed.ncbi.nlm.nih.gov/24133558/>
- Communication Authority of Kenya. (2019). *Communications Authority of Kenya*. Communications Authority of Kenya. <https://ca.go.ke/consumers/industry-research-statistics/statistics/>
- Diop, J., & Crul, S. (2014). *The mHealth opportunity in Sub-Saharan Africa; The path towards practical application*. Diop, J., & Crul, S. <https://www.google.com/search?client=firefox-b-d&q=Diop%2C+J.%2C+%26+Crul%2C+S.+%282014%29.+The+mHealth+opportunity+in+Sub-Saharan+Africa%3AThe+path+towards+practical+application.+Breda%3A+Deloitte>.
- Dodds, W. B., Monroe, K. B., & Grewal, D. (1991). Effects of Price, Brand, and Store Information on Buyers' Product Evaluations. *Journal of Marketing Research*, 28(3), 307. <https://doi.org/10.2307/3172866>
- Fishbein, M., & Ajzen, I. (1975). Belief, attitude, intention and behavior: an introduction to theory and research. *The National Academies of Sciences, Engineering, and Medicine*. <http://worldcat.org/isbn/0201020890>
- Fisher, Jeffrey D. Fisher, W. A. (1992). Changing AIDS-risk behavior. *Psychological Bulletin*, 111(3), 455–474. <https://psycnet.apa.org/doi/10.1037/0033-2909.111.3.455>
- Global Observatory for eHealth. (2011). *Global Observatory for eHealth*. <https://www.who.int/goe/en/>
- Harman, J. D. F. author K. R. A. A. F. J. (2008). The Information-Motivation-Behavioral Skills model of antiretroviral adherence and its applications Title. *Current Science Inc*. <https://link.springer.com/article/10.1007/s11904-008-0028-y>
- ICT Facts and Figures. (2016). *ICT Facts and Figures*. ITU. <https://www.google.com/search?client=firefox-b-d&q=%28ITU%2C+ict+facts+and+figures+2016>

- Lawrence Mbuagbaw et al. (2012). The Cameroon Mobile Phone SMS (CAMPS) Trial: A Randomized Trial of Text Messaging versus Usual Care for Adherence to Antiretroviral Therapy. *PLoS One*, 7, 12. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3516507/>
- Lester, R. T., Ritvo, P., Mills, E. J., Kariri, A., Karanja, S., Chung, M. H., Jack, W., Habyarimana, J., Sadatsafavi, M., Najafzadeh, M., Marra, C. A., Estambale, B., Ngugi, E., Ball, T. B., Thabane, L., Gelmon, L. J., Kimani, J., Ackers, M., & Plummer, F. A. (2010). Effects of a mobile phone short message service on antiretroviral treatment adherence in Kenya (WelTel Kenya1): A randomised trial. *The Lancet*, 376(9755), 1838–1845. [https://doi.org/10.1016/S0140-6736\(10\)61997-6](https://doi.org/10.1016/S0140-6736(10)61997-6)
- Malack, O., Philip, L., & Edward, N. (2015). Mobile Subscription, Penetration and Coverage Trends in Kenya’s Telecommunication Sector. *International Journal of Advanced Research in Artificial Intelligence*, 4(1), 1–7. <https://doi.org/10.14569/ijarai.2015.040101>
- Marshall H. Becker. (1974). The Health Belief Model and Sick Role Behavior. *Health Education Monographs*, 2(4), 409–419. <https://journals.sagepub.com/doi/abs/10.1177/109019817400200407>
- MOH. (2011). *National e-Health Strategy 2011-2017*. Nairobi: Ministry of Medical Services & Ministry of Public Health & Sanitation. MOH. <https://www.google.com/search?client=firefox-b-d&q=MOH.+%282011%29.+National+e-Health+Strategy+2011-2017.+Nairobi%3A+Ministry+of+Medical+Services+%26+Ministry+of+Public+Health+%26+Sanitation.>
- Mugenda, O.M. and Mugenda, A. G. (2003). Research Methods, Quantitative and Qualitative Approaches. *Open Access Library Journal*, 3. [https://www.scirp.org/\(S\(351jmbntvnsjtaadkposzje\)\)/reference/ReferencesPapers.aspx?ReferenceID=1917785](https://www.scirp.org/(S(351jmbntvnsjtaadkposzje))/reference/ReferencesPapers.aspx?ReferenceID=1917785)
- Munyua, S., Rotich, G., & Kimwele, M. (2015). Factors Affecting the Adoption of Mhealth in Maternal Health Care in Nakuru Provincial General Hospital. *INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH*. <https://www.semanticscholar.org/paper/Factors-Affecting-The-Adoption-Of-Mhealth-In-Health-Munyua-Rotich/9d5c5ad5cf4a4ea375f54fdbca2ded5859cca6f1>
- National AIDS Control Council. (2018). *National AIDS Control Council*. National AIDS Control Council. <https://nacc.or.ke/kenya-hiv-county-profiles>
- Rogers, R. W. (1975). A Protection Motivation Theory of Fear Appeals and Attitude Change1. *The Journal of Psychology*, 91(1), 93–114. <https://www.tandfonline.com/doi/abs/10.1080/00223980.1975.9915803>
- Scott M. Smith, P. . (2013). *Determining Sample Size How to Ensure You Get the Correct Sample Size*. Scott M. Smith, Ph.D. <https://www.qualtrics.com/blog/calculating-sample-size/>

- Sekaran, U. and Bougie, R. (2013). *Research Methods for Business: A Skill-Building Approach*. 6th Edition, Wiley, New York. *International Journal of Communications, Network and System Sciences*, 9. [https://www.scirp.org/\(S\(i43dyn45teexjx455qlt3d2q\)\)/reference/ReferencesPapers.aspx?ReferenceID=1869907](https://www.scirp.org/(S(i43dyn45teexjx455qlt3d2q))/reference/ReferencesPapers.aspx?ReferenceID=1869907)
- Shet, et al. (2010). Designing a Mobile Phone-Based Intervention to Promote Adherence to Antiretroviral Therapy in South India. *AIDS and Behavior*, 3(14), pages716–720. <https://doi.org/https://doi.org/10.1007/s10461-009-9658-3>
- Susan A. Brown and Viswanath Venkatesh. (2005). Model of Adoption of Technology in Households: A Baseline Model Test and Extension Incorporating Household Life Cycle. *JSTOR*, 29, 329–426. <https://www.jstor.org/stable/25148690>
- Valentin Rousson, Theo Gasser, B. S. (2012). Assessing intrarater, interrater and test-retest reliability of continuous measurements. *National Library of Medicine*, 22, 3431–3446. <https://pubmed.ncbi.nlm.nih.gov/12407682/>
- WHO. (2011). *New horizons for health through mobile technologies*. WHO. <https://www.google.com/search?client=firefox-b-d&q=WHO%2C+W.+H.+%282011%29.+mHealth-New+horizons+for+health+through+mobile+technologies>
- World Health Organization. (2019). *HIV/AIDS*. https://www.who.int/health-topics/hiv-aids/#tab=tab_1

APPENDICES

Appendix I: Research Questionnaire

This questionnaire has questions regarding the **EFFECTIVENESS OF THE MHEALTH USE ON PEOPLE LIVING WITH HIV/AIDS FOR TREATMENT, PREVENTION AND CONTROL IN KENYA: A CASE STUDY OF SWOP CLINIC**

DEMOGRAPHIC INFORMATION

To provide the following information tick in the bracket which corresponds to your answer.

1.	Gender: Female [], Male []
2.	Age: Below 30 years [], 31-40[], 41-50 [], Above 50 years []
3.	Employment: Formal [], business [], Unemployed [], Student []
4.	Education: Primary education only [], Secondary education [], University education [].
5.	Own Mobile phone: Yes [], NO [].

PERCEIVED SUSCEPTABILITY

Directions: Please answer the following questions by ticking on only one choice in the box based on the scales provided below.

5- Strongly Agree, 4- Agree, 3- Moderate, 2- Disagree, 5-Strongly Disagree

Questions	1	2	3	4	5
1. The information I get through mobile phone from the doctors has helped me to change my sexual behaviour.					
2. By use of mobile phones have been able to get information which has helped me always to monitor any changes in my health.					
3. Through the information I get through mobile phone from the doctors, i have the knowledge which assist me to avoid what me lead me to contract HIV/AIDS related disease.					
4. I always seek and get information from the doctors through mobile phone when I notice unique signs or symptoms in my body which could lead to getting sick.					

PERCEIVED SEVERITY

Directions: Please answer the following questions by ticking on only one choice in the box based on the scales provided below.

5- Strongly Agree, 4- Agree, 3- Moderate, 2- Disagree, 5-Strongly Disagree

Questions	1	2	3	4	5
1. The information i get through mobile phones from the doctor has helped my health to improve					
2. By getting health information from the doctors through mobile phone, HIV/AIDS has not negatively affected my life, how I see myself, my family and my daily duties.					
3. Stigma caused by HIV/AIDS reduced after embracing the health information through the mobile phones from the caregivers.					

PERCEIVED BARRIERS

Directions: Please answer the following questions by ticking on only one choice in the box based on the scales provided below.

5- Strongly Agree, 4- Agree, 3- Moderate, 2- Disagree, 5-Strongly Disagree

Questions	1	2	3	4	5
1. I understand the health information sent to me by health caregivers easily					
2. I have confidence the information I get through my mobile phone from health caregivers is private and confidential					
3. I have supply of electricity; I don't miss any information sent to me because my phone is always fully charged.					
4. I can afford the cost of receiving and sending health information to the doctors always when in need.					
5. I don't share my phone with anybody; I am comfortable receiving information regarding my health from the care givers through my mobile phone.					

PERCEIVED BENEFITS

Directions: Please answer the following questions by ticking on only one choice in the box based on the scales provided below.

5- Strongly Agree, 4- Agree, 3- Moderate, 2- Disagree, 1-Strongly Disagree

Questions	1	2	3	4	5
1. The reminder information to take my medication through mobile phone from the care givers has helped me not miss my medication.					
2. I don't miss my clinical appointments because i get alert message through my phone from the caregivers reminding me of the next appointment.					
3. By help of health information from caregivers my viral load has suppressed or reduced.					
4. I now eat well because of the information sent to me by health caregivers through mobile phone.					
5. The health information has encouraged me to change my bad behaviours which could worsen by condition.					

CUE TO ACTION

Directions: Please answer the following questions by ticking on only one choice in the box based on the scales provided below.

5-Strongly Agree, 4- Agree, 3- Moderate, 2- Disagree, 5-Strongly Disagree

Questions	1	2	3	4	5
1. My family support and encourage me to always use the mobile health for my treatment.					
2. I always seek health information through my mobile phones every time I experience pain from health caregivers.					
3. I am always motivated by information from the doctors through mobile phone to take the recommended actions towards my health					

SELF-EFFICACY

Directions: Please answer the following questions by ticking on only one choice in the box based on the scales provided below.

5-Strongly Agree, 4- Agree, 3- Moderate, 2- Disagree, 1-Strongly Disagree

Questions	1	2	3	4	5
1. I always get health information every time i need it through my mobile phone from the health caregivers.					
2. I have trust of the information which i get through mobile phone from my caregivers.					
3. I am always at ease when using mobile phone to seek health information from the health caregivers through my mobile phone.					

THREAT

Directions: Please answer the following questions by ticking on only one choice in the box based on the scales provided below.

5-Strongly Agree, 4- Agree, 3- Moderate, 2- Disagree, 1-Strongly Disagree

Questions	1	2	3	4	5
1. I use mobile health for treatment because my life is in danger					
2. My health has deteriorated and this makes me to always make use of health information which I get through mobile phone from my health caregivers.					
3. I no longer feel threatened by HIV/AIDS disease because by the health information sent to me from the doctors have been able to manage it.					

COST

Directions: Please answer the following questions by ticking on only one choice in the box based on the scales provided below.

5- Strongly Agree, 4- Agree, 3- Moderate, 2- Disagree, 1-Strongly Disagree

Questions	1	2	3	4	5
1. I always use mobile phone for accessing health information irrespective of the cost.					
2. The cost of treatment has reduced through the use of mobile health for treatment.					
3. The cost of accessing health information through mobile phone is high.					

INFORMATION

Directions: Please answer the following questions by ticking on only one choice in the box based on the scales provided below.

5-Strongly Agree, 4- Agree, 3- Moderate, 2- Disagree, 1-Strongly Disagree

Questions	1	2	3	4	5
1. I clearly understand the health information which I get through my mobile phone.					
2. I have full knowledge of status of my sickness and able to address the complications because of the health information which I get from my health caregivers through my phone.					
3. The health information through my mobile phone has helped me to protect myself from other HIV/AIDS related diseases.					

MOTIVATION

Directions: Please answer the following questions by ticking on only one choice in the box based on the scales provided below.

5-Strongly Agree, 4- Agree, 3- Moderate, 2- Disagree, 1-Strongly Disagree

Questions	1	2	3	4	5
1. The access of health information through mobile phones is cheap and this motivates me always to mobile health for my treatment.					
2. It is faster to access health information through mobile phone and this motivates me to use mobile phones for my treatment.					
3. The motivation from my family pushes me to seek treatment through mobile health.					

CONFIDENCE

Directions: Please answer the following questions by ticking on only one choice in the box based on the scales provided below.

5- Strongly Agree, 4- Agree, 3- Moderate, 2- Disagree, 1-Strongly Disagree

Questions	1	2	3	4	5
1. I have confidence that the health information I get through my mobile phone from the doctors will help to improve my health.					
2. I have full confidence on the health information I receive through my mobile phone from the health caregivers.					

EFFECTIVENESS

Directions: Please answer the following questions by ticking on only one choice in the box based on the scales provided below.

5- Strongly Agree, 4- Agree, 3- Moderate, 2- Disagree, 1-Strongly Disagree

Questions	1	2	3	4	5
1. The use mobile phone to access health information because it is accurate					
2. I use mobile phone to access information because I trust the information i get from the health caregivers.					
3. I will strongly recommend the use of mobile health for treatment to others					
4. The viral load have suppressed					
5. My overall health is very good now					

Thank you for your response to the questions

Appendix 2: Letter for Data Collection



UNIVERSITY OF NAIROBI
COLLEGE OF BIOLOGICAL AND PHYSICAL SCIENCES
SCHOOL OF COMPUTING AND INFORMATICS

Telephone: 4447870/4446543/4444919
Telegrams: "Varsity" Nairobi
Telefax: +254-20-4447870
Email: director-sci@uonbi.ac.ke

P. O. Box 30197
00100 GPO
Nairobi, Kenya

Our Ref: UON/CBPS/SCI/ MSC/ITM/2016

5th March 2020

Kenyatta National Hospital
Nairobi

Dear Sir/Madam

RE: RESEARCH PERMIT – NELLY MUTULI NDUNDA REG. NO. P54/85698/2016

The above named is a bona fide student pursuing an MSc course in Information Technology Management at the School of Computing and Informatics, University of Nairobi. She is currently carrying out her research on the project entitled "***Effectiveness of the use of M-health on people living with HIV/Aids for Treatment, Preventions and Control in Kenya***". The project involves gathering relevant information from various institutions and she has informed the office that she would wish to carry her research in your organization and is under supervision of Dr. Stephen N. Mburu.

We would be grateful if you could assist Ms. Ndunda as she gathers data for her research. If you have any queries about the exercise please do not hesitate to contact us.

Yours Faithfully

DR. ELISHA O. ABADE
AG. DIRECTOR
SCHOOL OF COMPUTING AND INFORMATICS

School of Computing & Informatics
University of NAIROBI
P. O. Box 30197
NAIROBI

EOA/jsn