mHEALTH UTILIZATION AND ACCESS TO TREATMENT BY TEENAGERS LIVING WITH HIV/AIDS IN ISLAND COMMUNITIES OF LAKE VICTORIA, KENYA

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mHealth Utilization and Access to Treatment by Teenagers Living with HIV/AIDS in Island Communities of Lake Victoria, Kenya

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2024

DECLARATION

This thesis is my original work and has not been presented for a degree in any other university

Signature ……Date…….

Alfred Bill Philip Okaka Olang'

This thesis has been submitted for examination with our approval as university supervisors

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DEDICATION

This thesis is dedicated to all HIV positive teenagers of island communities of Lake Victoria who seek access to and utilization of health services via mHealth.

This thesis is also dedicated to the Late Peres Wenje (PhD) of Masinde Muliro University of Science and Technology who provide insights on my work. May he rest in peace.

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ACRONYMS AND ABBREVIATIONS

AfriAfya	African Centre for Health Knowledge Management and Communication
ANC	Antenatal Care
ART	Anti Retroviral Therapy
ASFR	Age Specific Fertility Rate
CCK	Communications Commission of Kenya
HEI	HIV Exposed Infants
ITU	International Telecommunication Union
KAP	Knowledge, Attitudes and Practices
KDHS	Kenya Demographic Health Survey
KPHC	Kenya Population and Housing Census
mHealth	Mobile for Health
PEP	Post Exposure Prophyluxis
PMTCT	Prevention of Mother to Child Transmision
PrEP	Pre Exposure Prophyluxis
SRH	Sexual Reproductive Health
SSA	Sub Sahara Africa
VCT	Voluntary Counseling and Testing

DEFINITION OF OPERATIONAL TERMS

mHealth This is a general term for the use of wireless technology in therapeutic care (Meraz *et. al*, 2015). The most common is the use of mobile phones and other communication devices tablets to educate consumers by reaching out to the masses (Herd *et. al*, 2011). For this study, mHealth was the attempt to reach the public with health mobilization, education, prevention and treatment of HIV using mobile phone as receptors devices of broadcasted messages.

Teenager Living with HIV A common reference for a teenager, or teen, is a young person whose age falls within the range from 13 to 19 years of age (UNICEF, 2008). They are called teenagers because their age number ends with "teen." This study adopted the same, thus defining a HIV positive teenager as one living with the virus, either from birth or acquired, within 13 to 19 years of age.

Knowledge Management The practice of receiving, capturing, developing, sharing, and effectively using health information for self and community (Girard *et. al*., 2015). This study further defined knowledge management as the process where teenagers living with HIV/AIDS engage with a system and technology, process, data methods and techniques, for adaptation and how they learn from their environment. The study factored teenagers use of information received, captured, developed, and shared within their networks using mobile phones.

ABSTRACT

The utilization of mobile health (mHealth) technologies has the potential to transform healthcare delivery, particularly in resource-limited settings such as the island communities of Lake Victoria. This study explores the effect of mHealth utilization on access to treatment for teenagers living with HIV/AIDS in these communities, where traditional healthcare services face numerous challenges including geographical isolation, limited infrastructure, and socio-economic barriers. The research aims to provide a comprehensive understanding of how mHealth can enhance treatment access and improve health outcomes for this vulnerable population. The study population consisted of 409 teenagers in Ringiti, Remba, Rusinga, Mfangano, and Mageta islands. Questionnaires were administered to 173 sampled teenagers living with HIV as unit of analysis, and a control group made up of 30 percent of the sample that ascertained the effect of mHealth on treatment access. Most teenagers were aged 12-14 years old, with more males than females having access to smart phones. Mobile phone ownership and access were primarily through parents, siblings, and healthcare workers, who also bought airtime and bundles. Most teenagers spent 6-15 minutes accessing HIV information via mobile phones. The findings reveal a significant positive correlation ($R = 0.318$, $p < 0.001$) between the characterization of mHealth users and access to treatment, indicating that as the effectiveness of mHealth utilization increases, so does access to treatment. This suggests that mHealth technologies can play a crucial role in overcoming the barriers to treatment access in these communities. Moreover, the study found that knowledge management practices within mHealth applications significantly enhance treatment access. A positive correlation ($R = 0.549$, $p < 0.001$) was observed, underscoring the importance of comprehensive information dissemination, health education, and digital health literacy. The regression coefficients ($B = 0.512$) indicated that effective knowledge management within mHealth platforms leads to substantial improvements in treatment access, highlighting the need for well-designed educational components within these technologies.Technology obsolescence emerged as another significant factor influencing treatment access. The study found a positive correlation ($R = 0.346$, $p < 0.001$) between technology obsolescence and treatment access, suggesting that as newer technologies are adopted, access to treatment improves. Community-based health systems also played a pivotal role in facilitating treatment access. A significant positive correlation ($R = 0.339$, $p < 0.001$) was found between robust community health systems and improved treatment access. This highlights the importance of integrating mHealth initiatives with existing community health frameworks to enhance their effectiveness.In conclusion, the study demonstrates that mHealth technologies have significant potential to improve access to treatment for teenagers living with HIV/AIDS in the island communities of Lake Victoria. Effective utilization of mHealth, enhanced by robust knowledge management, up-to-date technology, and strong community-based health systems, can lead to substantial improvements in treatment access and health outcomes. This study contributes to the existing body of knowledge by highlighting the critical factors that influence the effectiveness of mHealth in improving healthcare access in resource-limited settings..

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

From 1995-2015, while global health spending increased, with middle-income countries experiencing the fastest growth, low-income countries spent less on health and HIV/AIDS, and further cuts could slow progress (Dieleman et al. 2018). Low-resource countries, like Kenya, rely on donor funding for implementation of policies adopted in combating HIV/AIDS: the 2000-2015 Millennium Development Goals (number 1 and 6; eradicate extreme poverty and hunger, and combat HIV/AIDS, respectively), realization of the UNAIDS 95.95.95 by the year 2030, Kenya's Vision 2030 (social pillar), and the 2016-2030 Sustainable Development Goals (numbers 3, 9 and 17). These policies, guidelines and milestones are aimed at achieving healthy lives and promotion of well-being for all at all ages.

Unfortunately, as funding to combat HIV/AIDS in developing countries is expected to range from US$397 to US $722 billion between 2009 and 2031 (Robert Hecht, 2010), and as the US Government under President Trump proposes to spend $1.1 billion less on HIV-treatment programs in sub-Saharan Africa (New York Times, 2017), there is regression in donor funding by almost 13% between 2014 and 2015 in low- and middle-income countries (UNAIDS and The Henry J Kaiser Family Foundation, 2016). The 2012 ambitious UNAIDS fast-track plan only received half of the funding, from expected US$35 billion to $19 billion per year (Resch et al. 2015). Due to limited and diminishing resources, discourse on HIV/AIDS epidemic among low-resource countries should transcend beyond access and utilization to sustainability of especially the emerging digital platforms (e and mHealth) for healthcare services. Notably, and through digital platforms, sub-Saharan Africa countries who rely heavily on external support for HIV response can improve fiscal space by exploring innovative, sustainable funding mechanisms (Olakunde, et. al, 2019).

1.1.1 Emergence of mHealth

Globally, seven billion people are covered by mobile-cellular network; 84 and 67 percent are in urban and rural respectively (International Telecommunication Union [ITU], 2016). Despite 75 percent of people in Africa being non-users (ITU, 2016), Kenya's mobile penetration was at 88.1 percent with 37.8 million subscribers (Communications Authority of Kenya [CAK], 2015). As mobile penetration hit the two-thirds mark in 2010 signifying a massive shift in the global digital commons (ITU, 2010), near-universal penetration is expected by 2020 (Banjanovic, 2009). Mobile phone has become an electronic wallet, the window to the World Wide Web, an education device, and more, and globally, mobile devices outnumber PCs, credit cards, and TVs (Lane, Isenberg, & Knoop, 2007).

The growth of ICTs in 49 countries in sub-Saharan Africa between 2000 and 2012 improved inclusive human development, with improvements in indicators of income levels, legal origins, religious dominance, political stability, overcoming landlockedness and increasing resource wealth (Asongu & Le Roux, 2017). International mobile remittances offer financial services to rural areas, bypassing banking institutions' challenges, as more people own mobile phones than formal bank accounts (Nyanhete,, 2017). The low-tech solution bridges the digital divide (Lane *et al.*, 2007) as growth of mobile phones is outpacing communication through mass media (Chipchase, 2005). Mobile phone coverage has also been accelerated by the rise in internet-enabled phones in Africa has been linked to increased financial inclusion, with a positive relationship between the two. Macroeconomic factors like capital formation, enrolment, and bank credit, as well as institutional factors like regulatory quality, are also crucial for financial inclusion (Evans, 2018). Further to the acceleration, governments, like South Africa are investing in widening mobile network infrastructure, making connectivity a possibility to many. Sookha (2018) opines that despite these efforts increase connectivity, more research needs to be done to connect the process to growth of a countries GDP. Using data from World Development Indicators from 2004-2014, on the contrary, Ejemeyovwi, et. al, (2020) indicate that there is impact of mobile technology adoption

on inclusive growth in 15 West African countries. Results show that mobile cell subscription has a statistically insignificant effect on inclusive growth, adding on to the positive role of mobile technology in human development (Ejemeyovwi, et. al, 2020). Notably, in some countries in Africa, like Ghana, the telecommunications industry is rapidly growing, impacting social and economic structures. A study in the Bamahu community assessed the implications of telecommunication usage for socio-economic development. Some users earn income from selling SIM cards, recharge cards, and mobile money transactions (Agbenyo,& Etse, 2017).

Unlike non-smart phone text messaging (SMS) services, with 3G (third generation) network, users of smart phones have increasing ability to create social change by access and broadcast of information. Thus, characterization of mobile phone handlers determines packaging and usability of information and Application Systems. Driven by market forces pegged on planned obsolescence in technology (LeBlanc *et al.* 2013), a paradigm shift to new age of digital literacy is realized. Notably are avatars, emoticons, pictures, sounds and videos that can hold more power than the bygone era of telephones where only names and numbers mattered (LeBlanc *et al.* 2013).

The interaction between users and mobile devices involves a two-step process: device computation and display, and user perception (Kaige Yan, Jingweijia Tan, Xin Fu, 2019). Users are sensitive to delay in step one, but faster execution doesn't always lead to better user experience. In step two, users interpret information less, and faster execution doesn't necessarily improve user experience. These determines use and discontinuation of smart or non-smart phones (Kaige Yan, Jingweijia Tan, Xin Fu, 2019).

Digital connectivity is crucial for the future of work in sub-Saharan Africa. Estimating the cost of introducing a 4G network by 2025 and a 5G network by 2040, the study estimates that it will cost approximately $14 billion for 4G and $57 billion for 5G, respectively. However, the study suggests that infrastructure alone is not enough to bridge the mobile Digital Divide, and policies are needed to address affordability and

knowledge gaps (Emre A, & Michal M., 2019). Also, despite issues associated with the digital divide, mobile telephony is growing on the continent and the rise of smartphones has given citizens easy access to social networking sites (Mutsvairo & Ragnedda, 2019).

Around 2010 to 2015, Sub-Saharan Africa reigned as the world's fastest-growing mobile region, with subscriber growth rates more than twice the global average (The Mobile Economy sub-Sahara Africa [MESSA], 2015). The growth of 3G (third generation) connections in Sub-Saharan Africa largely reflects the rising smartphone adoption rate, which has doubled in 2013 to 2015, that is, to 20% of total connections (MESSA, 2015). In Kenya, mobile phones are becoming widespread with 42 subscriptions per 100 people in 2008 (CAK, 2015).

About 27 percent of the 5.9 billion subscribers (ITU, 2010), who enable real-time communication in motion are under the aged 30 (Agar, 2003), and are in low-and-middle income countries (ITU, 2010). The massive population triggered the emergence of mHealth as a subset of eHealth, that is, the use of information and communication technology, such as mobile phones among others, for health services and information (Vital Wave Consulting [VWC], 2009). This has become an alternative access point for care and treatment (Kumar, Nilsen, Pavel, & Srivastava, 2013), as mHealth Applications (Apps.) enable collecting community and clinical data, delivery of healthcare information to practitioners, researchers, and patients, real-time monitoring of patient vital signs, and direct provision of care (Germanakos, Mourlas, & Samaras, 2005).

In Malawi, mobile devices have enabled the deployment of mobile health applications, offering services like maternal and child health, nutrition, and HIV management. However, most projects are pilot projects, not centralized, leading to lack of continuity and resource waste (Pankomera R, van Greunen D., 2018). In Kenya, for instance, the Uzazi Poa App. was developed to provide antenatal and postnatal healthcare information, complementing maternal healthcare institutions (Kariuki & Okanda, 2017).

Over 20,000 health-related Apps. Unlike 4,000 are available in 2015 as opposed to 2010, respectively (Pimmer & Tulenko, 2015); donors are lining up to support the scaling up of mHealth interventions (Qiang et al. 2011). An ICT model was proposed to manage sustainability of mHealth projects in Malawi, validating by experts from various fields. The model is relevant, useful, and applicable, allowing policymakers and ICT implementers to effectively utilize resources and ensure sustainability (Pankomera & van Greunen , 2018).

1.1.2 Teenagers Living with HIV and Their Access to Information and Treatment

By 2011, more than thirty years into the HIV/AIDS pandemic, about five million young people aged 15-24 were living with HIV (UNICEF 2011); representing 41 percent of all new infections. With 890,000 acquiring HIV each year, nearly 2,500 young people are infected day (Joint UN Programme on HIV/AIDS, 2010). At least 95 percent of new infections happen in less developed countries, with SSA being the hardest hit (UNICEF 2011).

While most of the new infections in SSA occur in adults over the age of 25, HIV disproportionately affects young people (UNAIDS GAP Report, 2014). More than 4 in 10 new infections among female are in those aged 15-24; a cohort at risk of equating to higher HIV prevalence rates when they are older (UNAIDS GAP Report, 2014). For example, in Mozambique, HIV prevalence is seven percent among 15-19-year-old but rises to 15 percent for 25 years old. Likewise, in Lesotho, HIV prevalence rises from four percent among 15-19-year-old to 24 percent among 20-24-year-old (UNAIDS GAP Report, 2014).

In Africa, as opposed to general population, the fishing communities have high HIV/AIDS prevalence rates (Kissling, Allison, Seeley, Russell, Bachmann, Musgrave, & Heck, 2005). Prevalence rates for fisherfolk were 20.3% in the Democratic Republic of Congo, 30.5% in Kenya and 24.0% in Uganda, representing 4.8, 4.5 and 5.8 times higher than in the general population respectively (Kissing *et al.*, 2005).

The Olowosegun et al. (2017) study analysed HIV/AIDS knowledge and vulnerability factors in the Kainji Lake Basin fisheries sector, with results showing low western education levels among respondents, with 99.5% aware but lacked knowledge on HIV/AIDS transmission and prevention. Only 27.1% received support in the fight against HIV/AIDS. Access to information was low for 42% of respondents. Enlightenment campaigns and education programs on safe sex and behavior change are recommended as key responses to address HIV/AIDS in the area.

Moreover, in Kenya and Uganda, this incidence was 2.1 and 1.8 times respectively higher than truck drivers who use roads along the lake region. Rates of HIV infection are even slightly higher for fisherfolk than for sex workers (Kissing *et al.*, 2005). A study by Kwena, et. al (2019) found a high HIV prevalence of 32%, with significant differences between men (29% and 38%). Factors such as HIV-negative sexual partners, circumcision, condom use, younger age, and location in Homa Bay, Kisumu, Siaya, and Busia counties reduced HIV risk. Longer distance to public health facilities also increased HIV prevalence. In Homa Bay County, there are over 15,000 children (aged 14 and below) in need of ART; concern for continued care and treatment, with decrease in non-adherence, will presumptively reduce incidences and prevalence into their adulthood (NACC Kenya County Profile, 2014).

Traditional practices associated with sexual norms impacts on spread of HIV infection. This includes unprotected sex during wife inheritance, setting up of new homes, youth entertainment, preparing to launch planting, harvesting, polygamous marriage and ritual performance (Otieno & Okuku, 2017). The homogeneous distribution pattern of HIV infection outside African fishing villages can be attributed to complex and diverse factors beyond individual behavior (Hoshi et, al, 2016). Villages and towns in the islands of Lake Victoria (Kenya), are dominated by hotels, bars, and tailoring shops, fueled by money from daily sales of fish, and residents seemed to encapsulate a phrase describing Luo's desire to enjoy their life; '*giheroraha*,' luo for 'they love pleasure' (Okoth-Okombo, 1999). Due to casual sexual relations in such environment, and as explained by the social epidemiology concept (Berkman & Kawachi, 2000; Freund

&McGuire, 1999), this relates to the early burden of the HIV/AIDS epidemic in SSA. Fishing communities in Uganda (Rakai district), Tanzania (Mwanza and Bukoba provinces) and Kenya (formerly Nyanza province) where the initial cases of HIV/AIDS were recorded in the early 1980s (Barnett & Whiteside, 2002).

In addition, fishing communities along Lake Victoria, Uganda, 64% of new HIV infections can be attributed to drinking alcohol. Interventions to reduce alcohol consumption should be integrated in HIV/AIDS prevention activities for populations in whom both HIV and alcohol consumption are highly prevalent (Kiwanuka et al. 2017). Despite effort to fight HIV/AIDS in Lake Victoria regions, both biomedical and social-cultural interventions like voluntary HIV counseling and testing (VCT), prevention of mother-to-child transmission (PMTCT), voluntary medical male circumcision (VMMC), and HIV Exposed Infant (HEI) intervention, Key Populations programming (KP), Pre- and Post-Exposure Prophylaxis (PEP and PrEP), and stopping levirate culture, all exclude direct involvement and engagement of teenage population.

Fishing communities in Kenya are at high risk for HIV infection, with studies showing a lack of condom use and sexual risky behavior. Despite the adoption of Voluntary Medical Male Circumcision as a prevention measure, HIV infections remain high. Sex in green lodgings and sex in unfamiliar locations continue to contribute to the rising HIV infection rate among fishermen (Ombere et al. 2018). A non-teenage focus intervention perhaps is a driver of adult-based HIV/AIDS information dissemination strategies in Kenya. Exclusion of non-teenage focus intervention present teenagers living with HIV from island communities of Lake Victoria, with single option to attempt to visit health facilities for medical information and services (International Planned Parenthood Federation [IPPF], 2010). However, lack of confidentiality, fear of mistreatment, inconvenient hours and locations of facilities, high costs of services, limited knowledge of available services (Tylee, 2007), lack of privacy and confidentiality, coupled with negative beliefs and attitudes by health care workers, are major barriers for teenagers to seek information (IPPF, 2010) at the health facility. Teenagers also shy away from

service offered based on marital status (Tylee, 2007), like couple counseling during pregnancy.

Teenagers living with HIV face many psychosocial challenges, including HIV disclosure to others – they need safe environments to disclose. Low self-efficacy to disclose was negatively associated to the outcome variable. While social self-disclosure was linked to individual factors such as self-efficacy, factors relating to the social context and teenagers' access to psychosocial resources play an important role. Interventions should enable them to make optimal use of available psychosocial resources even under constraining conditions such as disruptive family structures (Nöstlinger. et al., 2015).

In response to poor health indices catalyzed by low provision of health care services (KAIS, 2014) and low investment in healthcare infrastructure, it is presumed that mHealth ability to cross borders will bridge the gap in the islands. From 2012, teenagers living with HIV/AIDS from island communities of Lake Victoria Kenya have been exposed to various mHealth projects.

The Kisumu Medical and Educational Trust's SRHR information (*e* and *m* platforms) - Youth4life, an online platform for youth about sexual and reproductive health and rights, was launched in Kenya in October 2014. The Network of Adolescents and Youth of Africa (NAYA) uses radio, newspapers, and new media to educate 16–24-year-olds about sexual and reproductive health issues. They assessed Facebook, Twitter, and Google+'s influence on young people's access to information. M-Tiba, a Kenyan mobile health wallet, launched in 2016, has significantly impacted the country's healthcare sector. Developed by PharmaAccess Group, CarePay, and Safaricom, it allows users to save, receive, and send funds for healthcare access. M-TIBA is a leading financing and technology platform for health insurers developed In Kenya. It makes it easier to buy and administer health insurance, which is improving healthcare access and affordability for millions of customers in Africa.

The ADS Nyanza Youth ASK SMS Project under the SRHR Alliance GUSO Project made effort between June and September 2018 reached 960 teenagers with SRHR/HIV training. Marie Stopes Kenya M4RH Project – by the Kenya Division of Reproductive Health used to enhance access to family planning information via mobile for reproductive health (m4RH). A successful pilot project in 2010 aimed to evaluate the acceptability, feasibility, and potential behavioral impact of providing contraceptive information via text message on mobile phones.

Important for this study will be to understand mHealth by characterizing teenagers living with HIV from island communities of Lake Victoria and to what extent its (access) effects treatment. Establishing knowledge management and technology obsolescence, while exploring community-based health support systems that possibly facilitate suitable utilization of mHealth by teenagers living with HIV from the island communities of Lake Victoria. Using probit model, this study wishes to measure utilization of teenager on mHealth against access with interest in the number of: referrals made, ART initiated, and treatment adherents.

1.2 Statement of the Problem

The island communities of Lake Victoria face significant healthcare challenges, particularly among teenagers living with HIV/AIDS. Despite the availability of treatment, many teenagers in these remote areas struggle to access necessary healthcare services. This issue is compounded by geographical isolation, limited healthcare infrastructure, and socioeconomic barriers. In these communities, HIV prevalence among adolescents is notably high, with some areas reporting rates of 10-15%, far exceeding the national average (UNAIDS, 2023). The demographic profile of these communities reveals that approximately 30% of the population is under the age of 20, indicating a substantial number of teenagers at risk (Kenya National Bureau of Statistics, 2022).

Moreover, access to healthcare is a critical issue, as over 50% of teenagers in these island communities report significant difficulties in reaching healthcare facilities (WHO, 2022). The travel time to the nearest healthcare center often exceeds two hours by boat, posing a substantial barrier to regular healthcare access (Ministry of Health Kenya, 2021). Financial constraints further exacerbate the problem, making it challenging for these teenagers to afford frequent trips to healthcare facilities. This situation underscores the urgent need for alternative solutions to improve healthcare access for this vulnerable population.

Furthermore, Mobile health (mHealth) technologies have emerged as a promising solution to bridge the healthcare gap in remote and underserved areas. Mobile phone ownership among teenagers in the island communities of Lake Victoria is relatively high, with over 70% having access to a mobile phone (GSMA, 2022). However, the utilization of mHealth services remains suboptimal, with only 35% of these teenagers regularly using mHealth apps or services (African Population and Health Research Center, 2022). Several barriers, including digital literacy and network coverage, hinder the effective use of mHealth technologies. Only 40% of teenagers in these communities possess the digital skills necessary to use mHealth tools effectively, and 25% of the island areas suffer from poor or nonexistent mobile network signals (ITU, 2022).

Preliminary studies indicate that mHealth interventions can significantly improve health outcomes for teenagers living with HIV/AIDS. Teenagers who regularly use mHealth services are 20% more likely to adhere to their HIV treatment regimens compared to those who do not utilize such services (Thirumurthy et al., 2021). Additionally, mHealth interventions, such as SMS reminders and telehealth consultations, have been associated with a 15% reduction in missed medical appointments among teenagers in these communities (Odeny et al., 2019). These findings suggest that mHealth technologies have the potential to enhance treatment adherence and overall health outcomes for this population. Given the high HIV prevalence among teenagers in the island communities of Lake Victoria and the significant barriers to accessing traditional healthcare services, it is imperative to explore the role of mHealth in improving treatment access.

Addressing the issues of technology utilization, digital literacy, and network coverage is crucial to leveraging the full potential of mHealth interventions. This study aimed to investigate the effect of mHealth utilization on access to treatment among teenagers living with HIV/AIDS in these island communities, providing insights that can inform targeted interventions and policy decisions to enhance healthcare delivery and outcomes.

1.3 Objectives of the Study

1.3.1 General Objective

The general objective of the study was to determine the effect of mHealth utilization on access to treatment by teenagers living with HIV/AIDS in island communities of Lake Victoria.

1.3.2 Specific Objective

Specific objectives of the study were to:

i. Characterize mHealth utilization by teenagers living with HIV from island communities of Lake Victoria and its effect on treatment access.
ii. Establish the knowledge management of mHealth information by teenagers living with HIV from the island communities of Lake Victoria and its effect on access to treatment.
iii. Determine the effect of technology obsolescence on the utilization of mHealth information by teenagers living with HIV from the island communities of Lake Victoria and its effect on treatment access.
iv. Explore community-based health support systems that facilitate suitable utilization of mHealth by teenagers living with HIV from the island communities of Lake Victoria and its effect on treatment access.

1.4 Research Hypotheses

This research attempted to test the following alternate hypotheses:

- **H_{a1}:** There is a significant association between the frequency of mHealth utilization and improved treatment access among teenagers living with HIV from island communities of Lake Victoria.
- **H_{a2}:** Effective knowledge management positively correlates with increased access to mHealth information for treatment among teenagers living with HIV from island communities of Lake Victoria.
- **H_{a3}:** Technology obsolescence negatively impacts access to mHealth information for treatment among teenagers living with HIV from island communities of Lake Victoria.
- **H_{a4}:** The presence of robust community-based health support systems significantly contributes to sustainable access to mHealth information for treatment among teenagers living with HIV from island communities of Lake Victoria.

1.5 Justification of Study

The study's justification is rooted in the need to address the significant healthcare disparities faced by teenagers living with HIV/AIDS in island communities of Lake Victoria, where access to traditional healthcare services may be limited. The study aims to investigate how mHealth utilization can improve healthcare access, enhance health outcomes, and address health disparities among this vulnerable population. By understanding the factors that facilitate or hinder mHealth utilization, the study can inform policy and practice development, ultimately leading to improved treatment access, health outcomes, and health equity.

1.5 Significance of the Study

The study on the effect of mHealth utilization on access to treatment by teenagers living with HIV/AIDS in island communities of Lake Victoria is justified by the urgent need to

address healthcare disparities and improve health outcomes among this vulnerable population. In resource-limited settings such as island communities, access to traditional healthcare services may be limited, making innovative solutions like mHealth crucial for improving healthcare access and delivery. By investigating the impact of mHealth utilization on treatment access, the study aims to identify barriers, facilitators, and best practices that can inform targeted interventions and policy initiatives. Ultimately, the study seeks to contribute to efforts aimed at reducing health inequalities, promoting health equity, and enhancing the overall well-being of teenagers living with HIV/AIDS in island communities of Lake Victoria. The significance of the study on the effect of mHealth utilization on access to treatment by teenagers living with HIV/AIDS in island communities of Lake Victoria is multifaceted and far-reaching:

Improving Healthcare Access: By understanding how mHealth utilization influences treatment access, the study can inform the development of targeted interventions to improve healthcare access for teenagers living with HIV/AIDS. This is particularly crucial in island communities of Lake Victoria, where access to traditional healthcare services may be limited.

Enhancing Health Outcomes: Effective mHealth utilization has the potential to enhance health outcomes by ensuring timely access to treatment, medication adherence, and disease management. By identifying factors that hinder or facilitate mHealth utilization, the study can contribute to strategies aimed at improving health outcomes for teenagers living with HIV/AIDS.

Addressing Health Disparities: The study sheds light on disparities in healthcare access among vulnerable populations, such as teenagers living with HIV/AIDS in island communities. By identifying barriers to access, such as technology obsolescence and knowledge gaps, policymakers and healthcare providers can implement targeted interventions to bridge these gaps and promote health equity.

Informing Policy and Practice: The findings of the study can inform policy development and healthcare practices tailored to the unique needs of teenagers living with HIV/AIDS. By providing evidence-based recommendations, policymakers can enact policies that support the integration of mHealth technologies into healthcare delivery systems, thereby improving access to treatment and overall health outcomes.

Contributing to Academic Discourse: The study contributes to academic discourse by expanding our understanding of the role of mHealth in healthcare delivery, particularly in resource-limited settings. By generating new knowledge and insights, the study enriches existing literature on mHealth utilization and its impact on treatment access, thereby paving the way for further research and innovation in this field.

1.6 Scope of the Study

The study was carried out in islands of Ringiti, Remba, Rusinga, Mfangano and Mageta, which lie in the eastern part of Lake Victoria in Kenya, with its inhabitants majorly the Luo and Subas majority (Kenya National Statistics, 2009) ethnic groups. Teenagers targeted for this study were those in psychosocial support groups (registered) based in health facilities.

1.7 Study Limitations and Delimitations

This research did put into consideration the possibility that some respondents may not be willing to participant due to stigma (either from community or self-inflicted). This could potentially introduce bias from participants who are unwilling to participate due to the stigma associated with the topic. This could affect the representativeness of the sample and skew the results. To increase the willingness of young people to participate in the study, community social and health workers and nurses in charge of community-based care and treatment centers were used to introduce the study and obtain consent from respondents. These community-based individuals had established relationships with the community and helped build trust and rapport with the young people, making them more

likely to participate in the study. Their involvement also added a layer of credibility and legitimacy to the study, which further enhanced its acceptability to young people.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section delves into a comprehensive examination of the theoretical underpinnings and existing research related to treatment access for teenagers with HIV/AIDS through the use of mobile health (mHealth) technologies. It includes a critical analysis of the conceptual framework guiding mHealth interventions, a review of empirical studies on the effectiveness of mHealth in improving access to treatment for this population, summaries of key findings, and identification of research gaps that warrant further exploration. Through this exploration, the aim is to provide a holistic understanding of the current state of mHealth interventions for teenagers living with HIV/AIDS and to highlight areas for future research and intervention development.

2.2 Theoretical Framework

This study drew on four theoretical frameworks: the Health Belief Model, Knowledge Management Process Model, Technology Adoption Lifecycle Model, and Participation Development Approach. These theories provided a comprehensive foundation for understanding the factors influencing mHealth utilization and treatment access among teenagers living with HIV/AIDS in island communities of Lake Victoria. By integrating these theoretical perspectives, the study aimed to explore the interplay between individual beliefs, knowledge management practices, technology adoption dynamics, and community participation in shaping access to healthcare services for this vulnerable population.

2.2.1 The Health Belief Model

The Health Belief Model (HBM) explains and predicts health-related behaviors, particularly regarding the uptake of health services (Janz & Marshall, 1984). HBM

suggests that people's beliefs about health problems, perceived benefits of and barriers to action and self-efficacy explain engagement (or lack of engagement) in health-promoting behavior (Janz & Marshall, 1984). It opines that a stimulus, or cue to action, must also be present to trigger the health-promoting behavior (Janz & Marshall, 1984).

In operationalizing the theory, an attempt to establish characterization of mHealth access of teenagers living with HIV from island communities of Lake Victoria followed a cascade of (i) perceived threat (ii) perceived behavior, and (iii) modifiers such as variables, cues to action, and self-efficacy, and probes into demographics, personality, social class, and peer and reference group pressure, costs, painful, inconvenient, and unpleasant, as an angle of finding out if teenagers believe that the benefits by far outweigh the consequences of continuing the old behavior (Center for Disease Control and Prevention, 2004). The above set provided explanations, why teenagers living with HIV use mobile phones, frequency of use, length of engagement, social media sites known and accessed, and the global connections they have, and primary reason for using the favorite mHealth network.

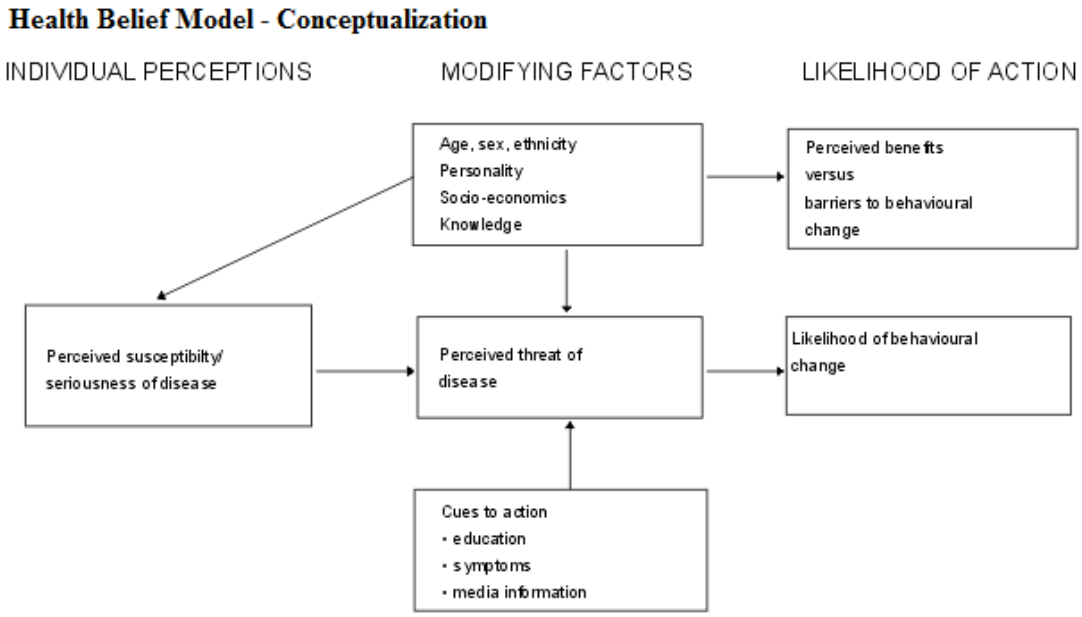


Figure 2.1: Health Belief Model Conceptualization

The Health Belief Model is beneficial in studying teenagers living with HIV/AIDS in Africa because it takes into account individual perceptions and beliefs about their health condition, as well as factors influencing their decision-making regarding prevention and treatment. This model can help identify barriers to accessing healthcare services, address misconceptions surrounding HIV/AIDS, and tailor interventions to effectively educate and support teenagers in managing their illness in a culturally sensitive manner. By understanding the teenagers' beliefs, motivations, and attitudes towards their health, researchers and healthcare providers can develop targeted strategies to promote positive health behaviors and improve outcomes for this vulnerable population.

This study took cognizant of the fact that theoretical constructs that constitute the HBM are broadly defined, as interpersonal influences are also particularly difficult to measure as cues (Rosenstock, 1974). Furthermore, the HBM does not specify how constructs of the model interact with one another (Glanz, Barbara, Viswanath, 2008). Therefore,

different operationalizations of the theoretical constructs may not be strictly comparable across studies (Maiman et al. 1977).

2.2.2 The Knowledge Management Process Model

Knowledge Management (KM) is considered the process of capturing, developing, sharing, and effectively using organizational knowledge (Davenport, 1994). KM includes (i) techno-centric - with a focus on technology that enhance knowledge sharing and creation (Alavi & Dorothy, 1999), (ii) organizational - how an organization can be designed to facilitate knowledge processes (Addicot et al. 2006), and (iii) ecological - the interaction of people, identity, knowledge, and environmental factors as a complex adaptive system akin to a natural ecosystem (Carlson et al. 2013).

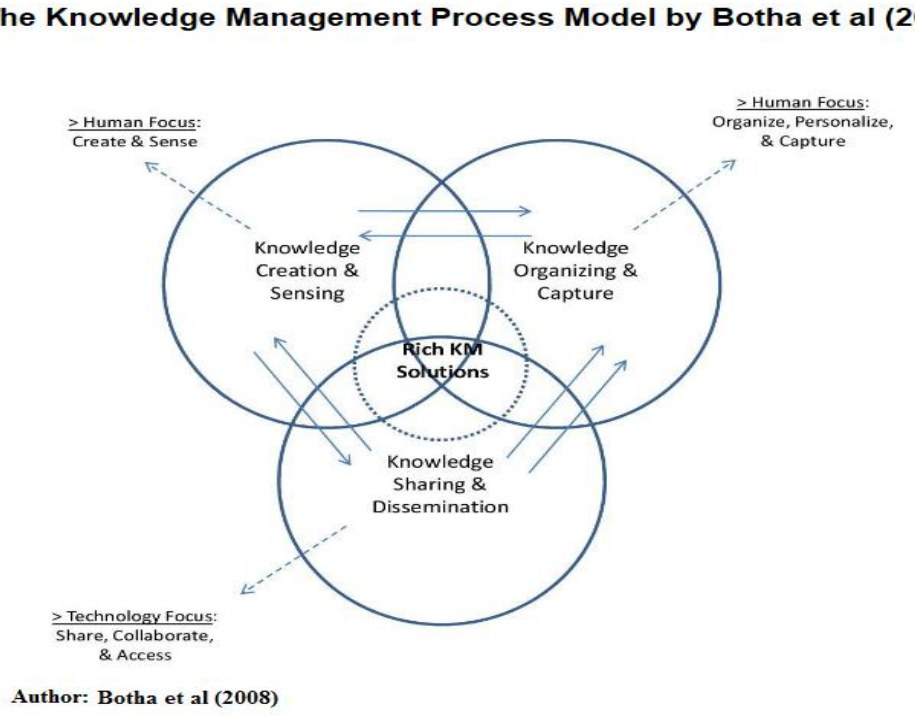
The techno-centric nature of mHealth applications enables teenagers to actively engage with and contribute to content related to HIV/AIDS. Through the ease of access and user-friendly interfaces, these Apps. allow teenagers to share their own experiences, modify existing content to make it more relevant to their peers, and disseminate vital information to raise awareness about HIV/AIDS. By empowering them to participate in the creation and sharing of content, these Apps foster a sense of ownership and agency among teenagers in combating the spread of the disease.

The techno-centricity of mHealth Apps provides teenagers with a platform to easily access information about their health and well-being. These Apps offer structured information flow through organized content, messaging features for communication with healthcare providers or peers, and feedback mechanisms for tracking progress or receiving guidance. This technology-centric approach makes it convenient for teenagers to engage with mHealth resources and stay informed about their health in a user-friendly manner.

The techno-centricity of mHealth Apps enables teenagers to access culturally specific and responsive ecological information through a scalable and replicable platform. By

leveraging technology, these Apps. can provide tailored support and resources that align with teenagers' cultural backgrounds and needs. This approach ensures that the information shared is not only relevant and accessible but also easily adaptable and transferable across different populations, ultimately enhancing the effectiveness and reach of health interventions among teenagers.

This study focused on getting the right knowledge to the right teenager at the right time, which implies a strong tie to an understanding of where and in what forms knowledge exists. This study also considered the KM creation processes that span organizational functions to ensure initiatives are accepted and supported by teenagers.



Source: (Botha et al., 2008)

Figure 2.2: Knowledge Management Process

The Knowledge Management Process Model is valuable for studying teenagers living with HIV/AIDS in Africa because it provides a systematic framework for capturing, organizing, sharing, and applying knowledge related to their healthcare and support needs. This model can help researchers and healthcare professionals better understand the challenges these individuals face, identify effective interventions, and facilitate the collaboration and communication necessary for addressing the unique issues of this population. By leveraging the Knowledge Management Process Model, stakeholders can work towards improving the quality of care and outcomes for teenagers living with HIV/AIDS in Africa.

This study considered the two strata of knowledge: explicit and tacit. In application, for explicit, teenagers living with HIV in the islands of Lake Victoria will be probed on: (i) if they create part of information circulating on mHealth or they are only recipients; (ii) how they store information generated or received in the wake of stigma and discrimination, privacy in accessing HIV treatment as a teenager, and staleness of information; (iii) how they share knowledge either among themselves or with other teenagers at community, national, regional and global levels; and (iv) the use of information through personal and group evaluation, refining and improving, or simply circulating it as part of routine dissemination.

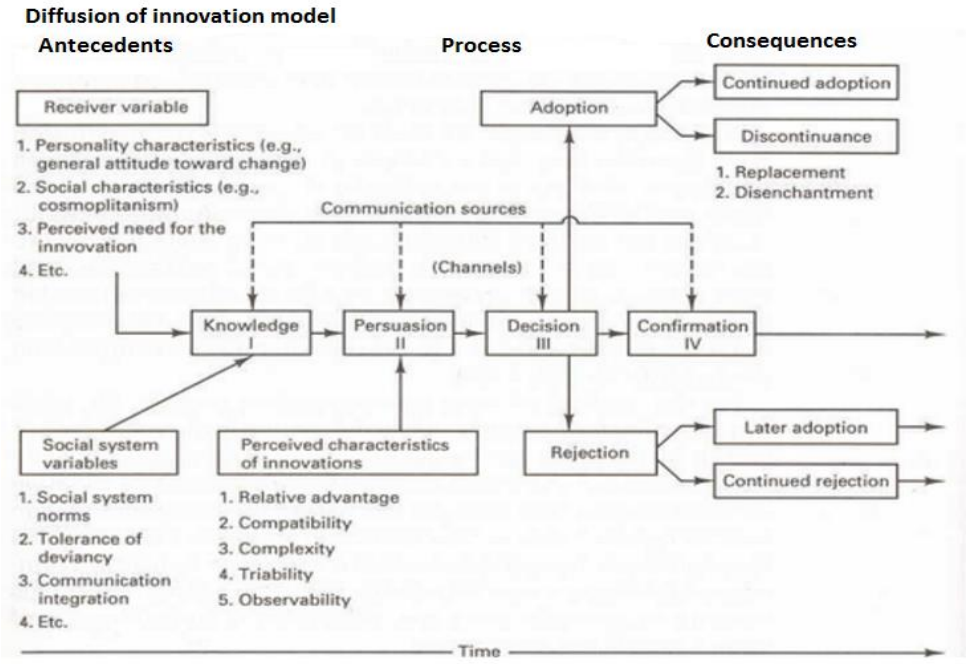
For tacit knowledge, with potential idiosyncratic issues arising from experiences as being a person living with HIV/AIDS, teenagers will be probed on: (i) if they do generate information on their personal lives and feed to the system; (ii) how they use the mHealth platform to synthesize tacit information – or group wares (like WhatsApp, Telegram, Instagram, among others); and (iii) how this information is stored for retrieval and usage among their groups.

2.2.3 The Diffusion of Innovation Theory

Diffusion of innovations explain how, why, and at what rate new ideas and technology spread (Rogers, 2003). Propounded in Everett Rogers's 1962 'Diffusion of

Innovations' book, the theory, narrates the process by which an innovation is communicated over time among the participants in a social system, as influenced by the innovation itself, communication channels, time, and a social system.

With focused on adoption of technology, obsolescence of desirability or stylistic obsolescence occurs when designers change the styling of products, so customers will increase frequency in purchase, due to the decrease in the perceived desirability of unfashionable items (My Money Bag, 2009), thus leading to continuation or discontinuation (through replacement or disenchantment). This study considered mHealth content (as health information) and mobile phones (as the medium), and if aesthetic is valued rather as opposed to functional reasons. This study presumed that teenagers desire to engage with more fashionable mHealth content through desirable mobile phones.



Source: Rogers (1995)

Figure 2.3: Difusion of Innovation Model

The Diffusion of Innovation Theory is beneficial in studying teenagers living with HIV/AIDS because it helps to understand how new information, technologies, or practices related to HIV/AIDS prevention and treatment can spread and be adopted within this population. By identifying the factors that influence the adoption of innovative strategies, the theory can inform interventions and initiatives that are tailored to the specific needs and circumstances of these teenagers, ultimately improving their health outcomes and quality of life.

Articles published on Diffusion of Innovations approach created a systematic theory which have not contributed much changes to the evolution of the theory (Greenhalgh, Robert, Macfarlane, Bate, Kyriakidou, & Peacock, 2005); a gap for criticism. This study also acknowledged that diffusion is difficult to quantify because humans and human networks are complex, thus, not possible to measure what exactly causes continuation or discontinuation (Katz, Levin, &Hamilton, 1963).

Continued adoption of mobile phones and mHealth content among teenagers living with HIV/AIDS is crucial in providing them with access to essential resources and support. Mobile phones offer a convenient platform for communication, education, and healthcare access, enabling teenagers to manage their health effectively. Increasing the frequency of mobile phone usage for mHealth content can empower teenagers with HIV/AIDS to better adhere to treatment plans, stay informed about their condition, connect with healthcare providers, and access vital support networks to improve their quality of life. Encouraging the consistent use of mobile technology among this demographic will ultimately contribute to better health outcomes and an improved overall well-being for teenagers living with HIV/AIDS.

Teenagers living with HIV/AIDS who discontinue mobile phone usage due to poor battery power and considering them old-fashioned may be influenced by societal pressure to adhere to trends and maintain social connections. This disconnect from modern technology can impact their access to important health resources, such as appointment reminders or medication alerts. It may hinder their ability to communicate

with healthcare providers or access information about their condition, potentially leading to delayed treatment or monitoring inconsistencies. Overall, this lack of communication may impede continuity of care and negatively impact their overall health outcome.

2.2.4 Participatory Development Approach

Participatory Development approach seeks to engage local populations in development projects (Cornwall, 2002), through a coherent and mutually supporting pattern of concepts, values, methods and actions, agreeable to wide application (Chambers, 1993). Therefore, Participatory Development is often presented as an alternative to mainstream top-down development (Mohan, 2008), in the hope of achieving sustainability of projects (Cornwall, 2002). The Participatory Development is also a significant approach for people-center and development oriented for it emphasizes and integrates quality of participation by members of a community as an affirmative action towards realization of sustainable development.

In operationalizing the theory, this study sought to determine the participation of teenagers in health facility-based HIV/AIDS support groups, in the development and utilization of mHealth Apps., as possibly a way of eliminating unjust hierarchies of knowledge, power, and economic distribution. Further, this study sought to determine involvement of teenagers enrolled in health facility-based HIV/AIDS support groups and the development of mHealth Apps. which can ensure their unique perspectives and needs are considered in combating the epidemic. Engaging teenagers in these initiatives can help break unjust hierarchies of knowledge, power, and economic distribution by empowering them to take control of their health and well-being. By giving teenagers a voice in these efforts, we can foster more equitable access to resources and support in the fight against HIV/AIDS.

The study sought to build insight into how community-based support systems facilitate utilization and sustainability coping mechanisms for teenagers on mHealth living with HIV from the island communities of Lake Victoria. This study sought to determine

community-based support systems to facilitate the utilization and sustainability of coping mechanisms for teenagers living with HIV in island communities of Lake Victoria because these systems can provide adolescents with the necessary resources, guidance, and emotional support to manage their condition effectively. By connecting them with local resources and peer support, these community-based initiatives can help reduce stigma and isolation, improve treatment adherence, and ultimately enhance the overall well-being and quality of life for teenagers living with HIV.

Critical was a probe on target audience significance in decisions concerning their lives, especially in the research, design, implementation, and evaluation stages of mHealth projects. Known target audience for mHealth projects give an opportunity for their input, which is essential in ensuring that the solutions are tailored to their specific needs and preferences. By involving the target audience in all stages of the project, from conceptualization, research to evaluation, mHealth interventions can be more assured of their effective, user-friendly aspects, and ultimately impactful in improving health outcomes. This approach helps in creating a stronger sense of ownership and engagement among the target audience, leading to better adoption and sustained use of the technology.

The study took cognizant of the fact that critics have faulted Participatory Development inadequacy to address other inequalities such as class. Participatory Development projects have also been accused of enabling tokenism, where a few ‘hand-picked’ local voices can speak as a ‘rubber stamp to prove participatory credentials’ (Mohan, 2008). The element of tokenism is instituted. In other circles, and due to projects at the "citizen control" level are committed but limited by resources, to enhance community participation, it has been suggested that projects at the "tokenism" level should be stepped up to the "citizen control" level (Kimengsi et al. 2016). Governments are asked to introduce tokenism bills to support community development efforts and introduce a platform for project sustainability (Kimengsi et al. 2016).

Also noted is that participatory development approaches through the promoting of tokenism have failed projects, as they often select a small group of individuals to represent local communities and give the appearance of inclusivity without genuine participation. This practice not only undermines the diversity and complexity of local perspectives but also perpetuates power imbalances within the decision-making process. It is essential for participatory development approaches for projects to prioritize meaningful engagement and empower marginalized voices to ensure genuine representation.

2.3 Conceptual Framework

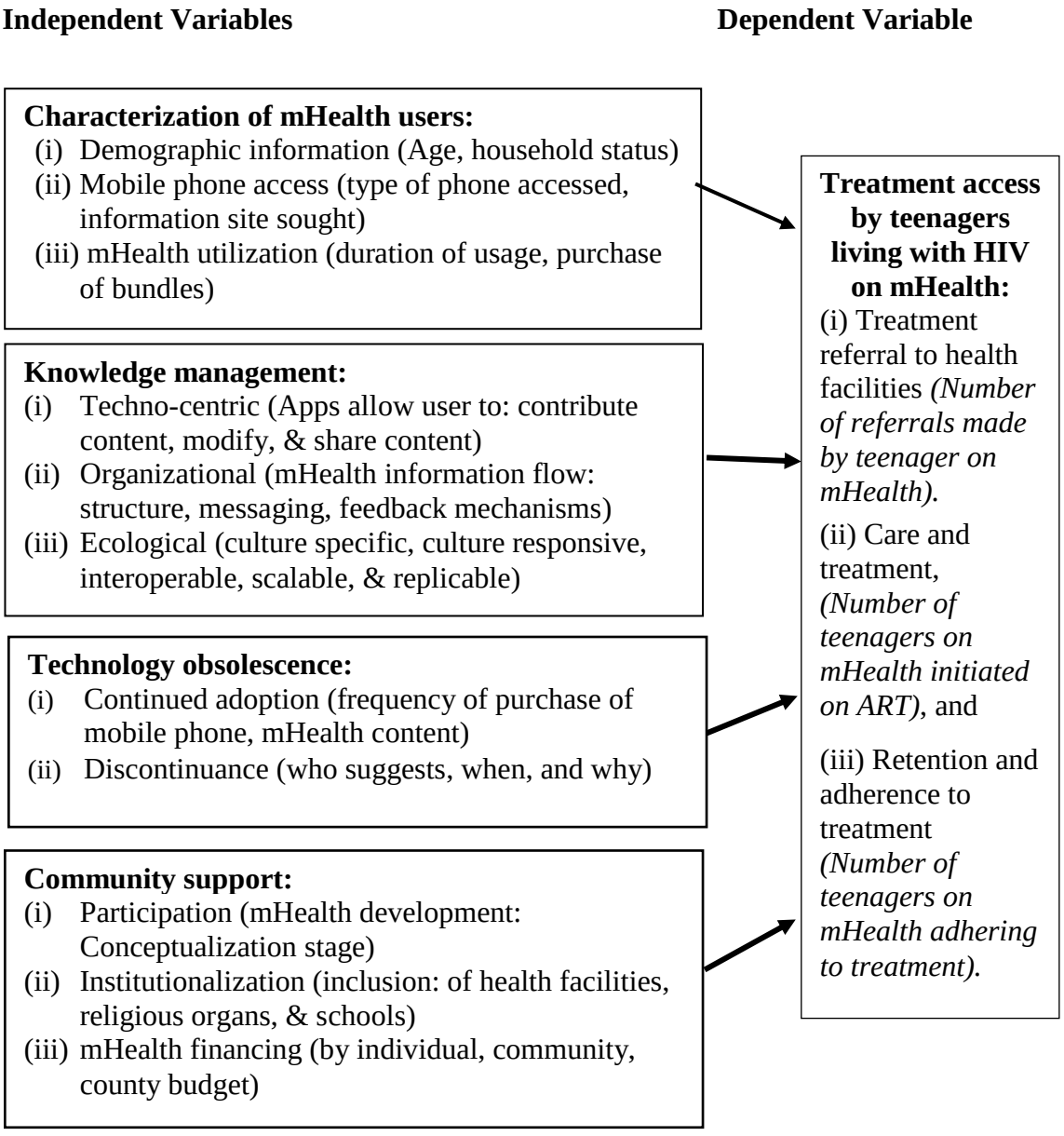


Figure 2.4: Conceptual Framework

The proposed conceptual framework provides a structural outline for organizing and understanding the relationships between concepts, theories, and variables for this study. It facilitates the conceptualization of this study, guides in development of research

questions, guides data collection and analysis, and provides platform to interpret the findings within a broader theoretical context.

The proposed conceptual framework encompassed characterization of mHealth users, that is, in terms of demographic information, individuals aged 13-19 are more likely to access mobile phones. Smartphone devices are commonly used for accessing health information websites or Apps, with mHealth utilization being prevalent among this demographic group. The study projects that duration of mHealth usage varies, with some using it daily for tracking health metrics or accessing virtual consultations. Additionally, individuals frequently purchase data bundles to support their mHealth needs.

The framework also facts knowledge management which encompasses various aspects such as techno-centric tools like apps that enable users to contribute, modify, and share content, organizational frameworks like mHealth information flow that focuses on structure, messaging, and feedback mechanisms, and ecological approaches that aim for culture-specific, culture-responsive, interoperable, scalable, and replicable solutions. By integrating these different dimensions, organizations can effectively manage and leverage their knowledge assets to drive innovation and success.

In the context of technology obsolescence, the framework considers it a multifaceted concept that encompasses both continued adoption and discontinuance. Continued adoption of mobile phones and mHealth content is driven by consumer demand for new features and capabilities, leading to frequent upgrades and purchases. Discontinuance, on the other hand, can be suggested by manufacturers, industry experts, or consumers themselves when a technology becomes outdated, incompatible, or no longer meets user needs. This can occur at any time depending on market trends, technological advancements, or shifts in user preferences.

The conceptual framework also looks into community support for mHealth development during the conceptualization stage can involve active participation from community members through providing feedback, sharing their needs and preferences, and

contributing ideas for the design and implementation of mHealth solutions. To ensure sustainability, the institutionalization of mHealth within health facilities, religious organizations, and schools is crucial as it creates a formal framework for integrating mHealth services into existing healthcare systems. Additionally, securing mHealth financing through various sources such as individual contributions, community fundraising efforts, and allocation from county budgets can help to ensure the long-term viability and effectiveness of mHealth programs within the community.

As key for measure on the effect of mHealth on access to care and treatment for teenagers, the framework defines by tracking and monitoring the number of referrals made by teenagers on mHealth, healthcare providers and policymakers can assess the effectiveness of this approach in connecting teenagers to necessary medical care and support services. This data can inform future strategies to enhance access to treatment for this vulnerable population. In addition, the care and treatment program focused on providing mHealth support to teenagers who have been initiated on antiretroviral therapy. This initiative aimed to improve adherence and health outcomes among this specific demographic, ensuring that they receive the necessary support and resources to effectively manage their HIV treatment. By utilizing mHealth technology, healthcare providers were able to remotely monitor progress, offer reminders for medication adherence, and provide educational resources, ultimately working towards better health outcomes for teenagers living with HIV.

2.4 Review of Empirical Literature

2.4.1 Characterization of mHealth Access of Teenagers Living with HIV

Unlike landlines, mobile phone usage in Africa has soared; now an integral part of the economy of African countries (Aker *et al.*, 2010). The demand for modern ICT services includes internet, cellular phone, broadband cable, fixed phone services, and asymmetric digital subscriber lines. Older ICTs like telegraph, radio, television, and newspaper are excluded (Njoh, 2018).

The spread of digital technologies has significantly impacted the global economy, contributing to US$3 trillion. The mobile phone revolution has significantly impacted low-income countries, enabling businesses and consumers to connect digitally. This has made mobile phones the most accessible and functional ICT in history, enabling billions of end-users to access information and communication (Roessler, P., 2018).

Although those who initially owned and used mobile phones were educated, wealthy, male and living in urban areas, more recently, cell phone use has expanded to include those living in rural areas, and those with fewer resources (Aker *et al.*, 2010). The digital divide between less advanced and developed economies is 31 points, with smartphone ownership rates increasing rapidly in emerging and developing nations. Majorities own mobile devices and increasing access to internet (Poushter, 2016).

Technology accessible by teenagers has exponentially expanded: for instance, globally, iPhone Apps. hit one billion users, Facebook added 100 million users, and YouTube uploaded an estimated 400 hours of video every minute in 2011, (Statistical Yearbook [SY], 2011). Teenagers fear of missing out was deduced by a University of Maryland study that suggested access to social media services may be addictive (Sikron, 2003).

The use of online social networking sites like Facebook has grown significantly due to its social and interpersonal benefits. It allows users to create profiles, make friends, and participate in computer-mediated environments (Dhir et al. 2017). Facebook is used by

people from diverse demographics and geographical settings, particularly adolescents and young adults. It offers various uses and gratifications, including communication, entertainment, escape, self-expression, and professional and academic exposure. The intensity of Facebook use has been associated with social and psychological outcomes like satisfaction with college life, civic participation, higher self-esteem, and social capital bonding (Dhir et al. 2017).

Economic and technological advancements in SSA provide opportunities to develop mHealth solutions to improve health care (Deloitte, 2012, Open Global Mobile Survey). Countries in SSA have become eager adopters and innovators of the use of mobile and digital technologies, thereby expanding the opportunities for the implementation of mHealth interventions (Opoku et. al, 2019). Sub-Saharan Africa is likely to be advanced in mHealth policy readiness due to outstanding growth in mHealth programs (Lee et al. 2018).

mHealth services, such as, simple text messaging to improve treatment compliance and applications for diagnostic and treatment support, and complex system infrastructures that enable remote monitoring and audio-visual communication for real time interaction between patients and providers are available (The Mobile Economy Report, 2014). The use of mobile technology as a clinical decision support system in sub-Saharan Africa shows potential for improving health service delivery in low-resource settings (Adepoju et. al, 2017).

Healthcare technologies in Africa have expanded due to factors like disease burden, shortage of health professionals, and population growth. However, developing countries lack directions to effectively use ICTs for health-specific purposes. Previous reviews on e-health and mHealth in Africa focus on enhancing standard care, implementing health technologies, disease management, and policies. Few reviews compare the varied purposes of using these technologies across sub-Saharan African countries (Bervell, & Al-Samarraie, 2019).

In low-income countries, the primary focus is on reducing health care costs, optimizing assets utilization and efficiency, delivering higher quality of care, and improving patient experience (The Mobile Economy Report, 2014). In SSA, the focus is in improving access to basic health care, remote diagnosis, remote monitoring and prevention; followed by access to health-related information, quality and effectiveness of service delivery, and reducing the shortage of well-educated health care professionals (The Mobile Economy Report, 2014).

Watkins et al. (2018) explored the use of mobile phones in rural South Africa, focusing on chronic disease patients, pregnant women, and health workers. The research found that some patients and health workers used their phones for healthcare but struggled with web search strategies. Doctors developed informal mobile health solutions due to their rurality and lack of resources. Physical and social factors influence the usability of mobile phones, and barriers to access remain, such as poor digital infrastructure and low digital literacy.

As mobile phones become widespread in Kenya (CAK, 2015), continued effort towards attaining efficient pro-poor health care requires an integrated approach, strategic partnerships and new business models (Deloitte, 2012, Open Global Mobile Survey). Innovations are crucial for bridging the gap in accessing safe, affordable, flexible, and high-quality services. Innovation can also change power relations and threaten existing interests, including incumbent firms, politicians, and professions (Mason et al. 2016).

Structured access is evident as, in a Prevention of Mother-to-Child Transmission of HIV/AIDS, expectant girls used cell phones to call their healthcare provider, for medication reminders and to schedule appointments. During the process, healthcare providers lauded the approach as very helpful, less time consuming, and more cost efficient than traditional methods of seeing or interacting with patients (Chang *et. al*, 2013). The rapid growth of mobile phone opened new opportunities for information sharing and service delivery in areas with inadequate infrastructure (Awiti et al. 2016).

Overly, mHealth has improved information systems and human resource capacity in low-income countries, thus improving HIV services, such as adherence to antiretroviral therapy and retention in care (Awiti et. al, 2016). Teenagers find mobile health applications informative, simple, networking-friendly, and providing timely updates. However, they cited reasons for deleting apps, such as excessive usage, notifications, or device space. They recommended a useful app with community connections, healthcare access, personal data tracking, health news, and privacy (Saberi et al. 2016).

Increase in application of mHealth in the health care industry (VWC, 2009) is presumed to provide quality and easily accessible care at lower costs (GSMA & PwC, 2012). For instance, remote health monitoring is a crucial aspect of mHealth, offering a cost-effective and efficient solution to meet the increasing demand for healthcare services (Pramanik et al. 2019).

mHealth offers numerous products and services for resource-poor settings, offering cheap, widely available tools for care delivery . Users include experts, front-line clinicians, and patients, with each accepting technology differently. Clinicians prioritize ease of integration and familiarity with technology, while front-line staff face challenges in data availability and signal coverage (Wallis et al. 2017). The health care industry is thought to be the most promising new mobile phone growth channel (Deloitte, 2012, Open Global Mobile Survey). The African communications revolution suggests mobile phones can help bridge healthcare gaps in resource-poor Sub-Saharan Africa, despite the need for digital capital and social networks (Hampshire et al. 2015).

2.4.2 Knowledge Management of mHealth Information by Teenagers Living with HIV

Globally, teenagers are sharing more information about themselves on their social media: in 2008, 91% post a photo of themselves, up from 79% in 2006, and 71% post their school’s name, up from 49%. Also, 71% post the city or town where they live, up

from 61% and 53% post their email address, up from 29%. A total of 20% post their cell phone number, up from 2% (SY, 2008).

Social media use by minors has significantly increased (Memon, A. M., Sharma, S. G., Mohite, S. S., & Jain, S., 2018). Young people in developing countries are increasingly using social media, mobile phones, and the internet for various reasons, including personal advancement, internal socialization, and extra personal socialization (Ngwainmbi, E. K., 2019). Teenagers use social media for entertainment, humor, and social connection, while negative use includes risky behaviors, cyberbullying, and self-degradation. Oversharing, stressed posting, and triggering posts are common (Radovic et al. 2017).

Social media technologies effectively engage teenagers, identifying behaviors and providing intervention (Yonker et. al, 2015). It is presumed that teenagers have also been part of the increase in voice calls and short messaging services, which hit 7.0 billion minutes of calls up from 6.3 billion minutes in 2012 alone (CAK, 2013). The average/cumulative Minutes of Use (MoU) per subscriber per month increased to 76.7 up from 71.2 in the previous quarter. The increase in MoU during the period indicates that subscribers could make longer or more calls. Similarly, a total of 1.0 billion SMS was sent in the quarter compared to 986 million in the previous period representing a 10.1 percent increase (CAK, 2013).

When teenagers on mHealth mutually exchange and create knowledge, it involves sharing, using and managing information which is considered Knowledge Management (Girard &Girard, 2015). In Africa, in rural Nigeria, teenagers share information, ideas and knowledge with their peers; with over half of the respondents abstaining from sexual activities because of information received from peers (Igbinovia & Ikenwe, 2015).

In Kenya, teenage girls met new people, found old friends, shared pictures, videos, and games in their network online via social media (Okaka & Makori, 2015). The increasing accessibility of smartphones and mobile internet has made social media an integral part

of Kenyan youth's daily lives (Ndlela et al. 2017). Electronic media significantly impacts teenage pregnancy among secondary school students due to its high usage and focus on sex-related information (Kimemia, & Mugambi, 2016). Also, most teenagers who contemplated termination of pregnancy chatted most with peer on how best to do so, by learning of safe methods, and related health complications (Okaka & Makori, 2015).

Knowledge has become the driving force for social development, the attention of the society to information and knowledge is rising and people's demands for information and knowledge is increasing step by step (Edem & Ani, 2010). Young people are increasingly using media to express themselves, explore identities, and connect with peers, presenting an opportunity for educators to promote active citizenship in media (Rheingold, H., 2008). Smartphone games, grounded in behavioral theory and evidence-based practice, are valuable tools in youth HIV prevention efforts in Sub-Saharan Africa, ensuring safer sexual debuts for high HIV prevalence youth (Winskell et al.., 2018).

HIV care retention text-messaging intervention improved antiretroviral therapy adherence, and retention during the first year of care. Retention is crucial for timely treatment initiation, viral suppression, reduced transmission, and preventing AIDS-related deaths (van Der Kop, 2019). Teenagers, recognized as a critical intervention cohort (NACC, 2017), makes it is pertinent to understand how they get informed via mHealth for decision making on matters HIV and AIDS.

2.4.3 Technology Obsolescence on Utilization of mHealth Information by Teenagers Living with HIV

Bernard London's pamphlet of 1932, '*Ending the Depression Through Planned Obsolescence*,' would have the government impose a legal obsolescence on consumer articles, to stimulate and perpetuate consumption (LeBlanc *et al.*, 2013). Obsolescence, the premature wear and tear of products, is a significant concern (Brönneke, 2017). The

end of a product's life is a crucial indicator of its success and failure, comparing its value against manufacturing costs and environmental impacts. In fast-changing technologies, product obsolescence is a significant concern, especially when production volumes are high (Burns, 2016).

Through global value chains, there has been growth in interconnectedness as Multinational Enterprises play an increasingly larger role in the internationalization of business. In response, governments have cut Corporate Income Tax rates or introduced new incentives for research and development to compete in this changing geopolitical landscape (LeBlanc *et al.*, 2013). Obsolescence affects innovation as it is highly pegged to adaptation or discontinuation of products and services in the market; teenagers will equally be aligned to the same cascade, that is, early adopters, early majority, late majority, and laggards, as mobile phones infiltrate the markets in SSA (Lamb et al., 2009).

The circular economy and bans on built-in obsolescence are popular solutions to shorten product lifespans (Wieser, 2016). Today, obsolescence affects diffusion of innovation as it subjected to lifespan-limited design, where all consumer products have an expected average lifetime permeating all stages of development (LeBlanc *et al.*, 2013). Innovation is equally affected by style obsolescence where manufacturers will release slightly updated products at regular intervals and emphasize their value as status symbols (LeBlanc *et al.*, 2013). Consumer society's increasing goods availability leads to intransparent product quality, premature obsolescence, often due to profit maximization strategies, prompting consumer protection policies to combat this issue (Kurz, R., 2015). The arguments of style obsolescence are tied to the meaning of end of a product's life is a crucial indicator of its success and failure, comparing its value against manufacturing costs and environmental impacts. In fast-changing technologies, style obsolescence is a major concern, especially when production volumes are high (Burns, 2016).

In developed countries, where many industries already face a saturated market, this technique is often necessary for producers to maintain their revenue. Capitalistically, planned obsolescence is advantageous as it stimulates demand by encouraging purchasers by putting them under pressure to buy sooner if they still want a functioning product (Guiltinan, 2009). Product longevity is influenced by design, manufacturing decisions, and consumer behavior, including discarding functional items (Cooper, 2016).

Companies employ planned obsolescence as a marketing strategy to encourage customer repurchase of new products, aiming to boost revenue and profit by reducing the value of older versions . Planned obsolescence encourages consumers to purchase new products by making them incompatible with old versions, thereby reducing the value of previous versions. (Kuppelwieser et al. 2019). Africa's population aged 16-34 accounting for 65 percent of the entire continent's billion-dollar consumer spending; this is the fastest growing continent with smart-phone use, advertisers are obsessing on how best to reach them (Mail & Guardian Africa Business Magazine, 2015). With arguably the strongest and most passionate musical culture on the planet, by 2020 the teenage and youthful population will dominate Africa's $1.3 trillion consumer spending (Frukt, 2015). For such profits to be realized, the continued change in mobile phones physical outlook, their software, and supporting social media platforms becomes the playing ground for continued appreciation of emerging mobile content that attracts the young people (LeBlanc *et al.*, 2013).

In addition to adverts, gamification has gained popularity in the world of marketing and customer loyalty (Gartner, 2016). Gamification is a popular design strategy in online retailing, but its attributes and influence on consumer behaviours are driven by brand love and desirable consumer behaviours, such as brand loyalty and positive word-of-mouth (Hsu, C. L., & Chen, M. C., 2018). Modern technologies have enabled the use of game mechanisms to increase customer involvement. Service providers offer App. design and customer involvement solutions, influencing customer behavior. Young, educated customers are most susceptible to gamification, anticipating entertainment, rivalry, and interesting Apps. (Zatwarnicka-Madura, 2015).

Evidently, beside the mHealth market offering the desired possibilities of data collection (where mobile devices replace and/or complement traditional paper-based tools); and behavior change, (where mobile devices are used to disseminate key messages and good practices among communities in Africa), there are direct contribution to the global mobile phone market revenue, which is predicted to grow to from 4.5 to 24 billion USD from 2013 to 2018 respectively (GSMA & PwC, 2012).

2.4.4 Sustainability_Through_Community-Based Health Support Systems That Facilitate Utilization Coping Mechanisms for Teenagers on mHealth Living with HIV

Globally, there's a renewed focus on local HIV/AIDS sustainability, ensuring funders can sustain programs (Gibbs et al. 2015). The fight against HIV and AIDS has made significant progress, with the international community's unprecedented financial investment achieving and exceeding MDG targets. However, the discourse now emphasizes the need for greater funding sustainability and the continuation of certain interventions (Oberth & Whiteside, 2016). Discourse on sustainability of community-based HIV/AIDS projects in SSA, is because the epidemic has affected the family as a functioning system, threatened its supportive capacity, and redefined the manner of coping and adapting mechanisms (Makoae, 2005).

HIV/AIDS remains a significant international health concern, with sub-Saharan Africa being the most affected region (Dwyer-Lindgren et al. 2019). Over 25.6 million people live with HIV, accounting for two-thirds of global infections and 70% of AIDS-related deaths. Despite gradual to moderate declines in HIV occurrence, prevalence rates continue to increase in countries like Lesotho, Botswana, and South Africa. Factors contributing to high HIV prevalence include traditional, behavioral, social, and material factors. Prevention programs and strategies for addressing the issue are crucial (Amuche et al., 2017). Low-risk sex users drive Nigeria's HIV epidemic, while high-risk groups like female sex workers, men with men, and drug users contribute significantly to new infections (Awofala & Ogundele, 2018).

There is a shift in family structure, with young adults leading smaller families and ageing parents managing larger multi-generational ones. This shift has led to a shift towards new forms of support like churches and neighboring. There are significant transformations, with young adults leading smaller families. The extended family's role has diminished, with new support forms like churches and neighbors becoming more important (Makiwane et al. 2017). While in the grandparents often care for dysfunctional children due to alcohol, drug abuse, or mental issues, in Africa, grandparents are more involved in young childcare, viewing it as natural and as a result of the AIDS epidemic (Mtshali, 2015). With an estimated 2.7 million people in SSA becoming newly infected, it is projected that close to 25 million children will become orphans by the 2010 (Heymann et al. 2007); this calls for a response to factors which might challenge viability and relevance of mHealth projects targeting teenagers living with HIV/AIDS.

In low-income countries, negative attitude of society exhibited by discrimination and stigmatization (Bonuck, 1993), affects not only physical health but mental and social conditions of persons living with HIV/AIDS (Peltzer & Ramlagan, 2011), making them experience social drift (Kadushin, 1996) with loss of family as major sources of support (Hall, 1999). HIV/AIDS stigma is a significant global health concern, affecting treatment and health of people with HIV/AIDS, particularly when health professionals exhibit negative attitudes towards them (Varas-Díaz et. al, 2017). HIV stigma in the general population reduces voluntary counselling and testing, increases sexual risk-taking behavior, and may manifest as negative attitudes or specific behaviors targeting PLHIV. A study in sub-Saharan Africa found that increasing antiretroviral therapy (ART) coverage led to a significant decrease in HIV-related stigma among women and men (Chan et al. 2015). As a result, coping with HIV infection also requires community support (Florence, Lutzen, & Alexius, 1994), with disclosure of status to support groups results in greater social and emotional support for PLWHA (Bor, Miller, & Goldman, 1993). It is therefore suggested that a process by which citizens act in response to public concerns, voice their opinions about decisions that affect them, and take responsibility

for changes to their community should be initiated (Armitage, 1988); hence defining Participatory Approach.

Despite the rapid uptake of Participatory Approach approaches in the 21st century, the central danger lies in the fact that organizations are simply using the name and techniques of Participatory Approach without any thought or uptake of the philosophy of PA (Chambers, 1997). Some of the challenges in applying Participatory Approach arise from issues of power, trust, cultural competence, respectful research practices, and recognition of health assets, leading to advocacy for culturally appropriate approaches and participatory methods, aiming to improve health outcomes for marginalized groups (Keikelame & Swartz, 2019).

It should be noted that Participatory Approach is about needs identification and problem resolution at a fundamental level, that is, if no action is taken on the communities' recommendations, the groups involved become demoralized and demotivated (Chambers, 1997). However, there are disadvantaged minorities (which may include teenagers) whose participation in development activities may be strongly resisted by gate keepers and dominant community-based groups (Nöstlinger, Loos, & Verhoest, 2015). Inclusion can highlight diverse livelihood strategies necessitating specialized governmental and donor policies to effectively combat poverty (Beall & Piron,, 2005).

There is also the risk that a participatory methodology is providing a rational, systematic and coherent framework from which to work from. Bad experiences with (non-) supporting agencies may have robbed them of any hope for improvement, depleted their self-confidence and increased their distrust of outsiders – resulting in a 'culture of silence' (Nöstlinger*et al.*, 2015). Nevertheless, PA uptake by organizations is encouraging (World Bank, 1994), as lack of appropriate participatory approaches limit uptake and sustainability of development initiatives has recently been linked to over-reliance on 'expert' knowledge and inadequate appreciation of local development priorities (Tufte, 2009).

2.4.5 Access to Treatment by Teenagers Living With Hiv/Aids

Access to treatment for teenagers living with HIV/AIDS is a critical aspect of managing the disease and improving health outcomes (Smith et al., 2019). Empirical evidence suggests that access to treatment among this population is influenced by various factors, including healthcare infrastructure, availability of resources, socioeconomic status, and individual health-seeking behaviors (Jones & Brown, 2018).

Research indicates that geographical barriers, such as living in remote or underserved areas, can significantly impact access to treatment for teenagers with HIV/AIDS (Gupta et al., 2020). Limited healthcare facilities, shortage of healthcare providers, and inadequate transportation infrastructure can hinder adolescents' ability to access essential HIV/AIDS treatment services (Wang et al., 2017). Moreover, the lack of specialized pediatric and adolescent HIV care facilities in many regions exacerbates the challenges faced by this vulnerable population (Nguyen et al., 2021).

Socioeconomic factors also play a crucial role in determining access to treatment among teenagers living with HIV/AIDS (Wilson & Parker, 2019). Studies have found that adolescents from low-income households or marginalized communities are less likely to access healthcare services due to financial constraints, lack of health insurance, and out-of-pocket expenses associated with treatment (Garcia et al., 2018). Additionally, stigma and discrimination related to HIV/AIDS may deter teenagers from seeking care, further exacerbating disparities in treatment access (Lee et al., 2020).

Individual health-seeking behaviors, including knowledge about HIV/AIDS, awareness of available treatment options, and adherence to treatment regimens, significantly influence access to care among teenagers (Miller & Jackson, 2019). Research suggests that comprehensive health education programs tailored to adolescents can improve their understanding of HIV/AIDS and empower them to navigate healthcare systems effectively (Choi & Kim, 2018). Additionally, interventions aimed at promoting treatment adherence, such as peer support groups and mobile health (mHealth)

applications, have shown promise in enhancing access to treatment and improving health outcomes among teenagers living with HIV/AIDS (Wang et al., 2021). Overall, empirical evidence highlights the multifaceted nature of access to treatment for teenagers with HIV/AIDS and underscores the need for comprehensive, integrated approaches to address barriers and facilitate equitable access to care (Brown & Smith, 2020). By addressing structural, socioeconomic, and individual-level factors, healthcare systems can ensure that teenagers living with HIV/AIDS receive timely and appropriate treatment, leading to better health outcomes and improved quality of life.

2.5 Critique of Reviewed Literature

The studies mentioned provide valuable insights into the broader landscape of mobile health (mHealth) and its impact on various populations, including those in low-income countries like those in Sub-Saharan Africa (SSA). However, a critical examination reveals certain limitations when it comes to characterizing mHealth access for teenagers living with HIV in specific regions such as the Lake Victoria islands (Awiti et al., 2016; Deloitte, 2012; Lee et al., 2018). Geographical relevance is a crucial factor to consider when evaluating the applicability of these studies to the context of Lake Victoria islands. While some research touches upon healthcare challenges in SSA, including areas with poor infrastructure like rural South Africa, there's limited direct relevance to the specific challenges faced by teenagers living with HIV in these islands. The unique socio-economic, cultural, and geographical context of Lake Victoria islands might present distinct barriers and opportunities that are not adequately addressed in the existing literature (Hampshire et al., 2015).

Methodological rigor is another aspect that warrants scrutiny. Evaluating the robustness of the research methodologies, sample sizes, data collection techniques, and analysis methods used in these studies is essential for determining the reliability of their findings. Studies with rigorous methodologies are more likely to provide accurate insights into mHealth access for teenagers living with HIV in Lake Victoria islands (Dhir & Tsai, 2017). Furthermore, a comprehensive critique should examine the intersectional

dynamics at play. Factors such as stigma, socioeconomic status, gender, and cultural norms can significantly influence teenagers' access to and utilization of mHealth services in this context. Understanding these intersecting factors is essential for designing interventions that are sensitive to the diverse needs and experiences of teenagers living with HIV in Lake Victoria islands (Chang et al., 2013).

The provided information highlights global trends in increased social media use among teenagers and the potential for knowledge exchange (SY, 2008). However, there's limited specificity regarding how this phenomenon applies to teenagers living with HIV in Lake Victoria islands. Understanding the unique challenges and opportunities faced by this specific demographic is essential for tailoring interventions effectively (Awiti et al., 2016). Factors such as internet connectivity, smartphone ownership, and digital literacy levels vary within different regions and communities, influencing the reach and impact of social media-based interventions (Ndlela & Mulwo, 2017).

Moreover, while studies demonstrate the potential effectiveness of electronic media, including smartphone games, in HIV prevention efforts, there's a need to assess their relevance and applicability to the specific context of Lake Victoria islands (Winskell et al., 2018). Interventions must be culturally appropriate and address the unique needs and challenges faced by teenagers living with HIV in this region (Radovic et al., 2017). Additionally, while text-messaging interventions show promise in improving antiretroviral therapy adherence and retention, the scalability and sustainability of such interventions in resource-constrained settings like Lake Victoria islands need careful assessment (van Der Kop, 2019). Factors such as infrastructure limitations, cost-effectiveness, and long-term engagement must be considered in the critique (Memon et al., 2018).

The discourse on technological obsolescence and its impact on teenagers living with HIV/AIDS in Victoria Islands warrants a critical examination through several lenses. Firstly, the concept of planned obsolescence, as proposed by Bernard London in 1932, has significant implications in the context of mobile phone technology. With Africa

experiencing a surge in smartphone adoption, particularly among teenagers, the rapid evolution of mobile devices driven by planned obsolescence strategies raises concerns about the accessibility and affordability of newer technologies for teenagers in resource-constrained settings like Victoria Islands (LeBlanc et al., 2013). Moreover, the emphasis on style obsolescence, where manufacturers release slightly updated products at regular intervals to maintain revenue, may contribute to a cycle of perpetual consumption, potentially exacerbating economic disparities and environmental concerns in the region (LeBlanc et al., 2013; Burns, 2016).

Secondly, the convergence of mobile technology and marketing strategies, such as gamification, presents both opportunities and challenges for teenagers living with HIV/AIDS in Victoria Islands. While gamification can be utilized to enhance engagement and adherence to mHealth interventions, it also raises ethical considerations regarding data privacy and the commodification of healthcare (Hsu & Chen, 2018). Additionally, the increasing focus on teenagers as a lucrative consumer demographic by advertisers and service providers underscores the need for regulatory frameworks to protect vulnerable populations from exploitative practices and ensure equitable access to essential healthcare services (Mail & Guardian Africa Business Magazine, 2015). Critically evaluating the impact of technological obsolescence and marketing tactics on teenagers' access to healthcare information and services is essential for designing sustainable and ethically sound interventions in Victoria Islands.

The discourse on sustainability in community-based health support systems for teenagers living with HIV/AIDS in Lake Victoria Islands is crucial, especially given the complex social and economic dynamics of the region. While there is a global emphasis on local sustainability in HIV/AIDS programs, particularly in sub-Saharan Africa, where the epidemic is most prevalent, challenges persist in effectively implementing participatory approaches that ensure the viability and relevance of mHealth interventions (Gibbs et al., 2015; Chambers, 1997). Despite the significant progress made in combating HIV/AIDS, the enduring stigma and discrimination faced by people living

with HIV/AIDS (PLWHA) pose significant barriers to community support and engagement (Varas-Díaz et al., 2017).

Furthermore, the uptake of participatory approaches in community-based health support systems is not without challenges, including issues of power dynamics, cultural competence, and recognition of health assets (Keikelame & Swartz, 2019). The risk of tokenistic participation and the failure to address the fundamental needs and priorities of marginalized groups, including teenagers living with HIV/AIDS, may undermine the effectiveness and sustainability of mHealth interventions (Chambers, 1997; Beall & Piron, 2005). Additionally, the "culture of silence" resulting from past negative experiences with supporting agencies highlights the importance of building trust and fostering genuine community engagement in the design and implementation of health programs (Nöstlinger et al., 2015).

Moreover, while participatory methodologies hold promise for facilitating utilization coping mechanisms among teenagers living with HIV/AIDS, the lack of appropriate approaches and inadequate appreciation of local development priorities may hinder the long-term sustainability of community-based health support systems (Tufte, 2009). Therefore, there is a need for organizations and stakeholders to not only adopt participatory approaches but also ensure their meaningful implementation, taking into account the diverse needs and experiences of teenagers living with HIV/AIDS in Lake Victoria Islands. By addressing these challenges and fostering genuine community empowerment, sustainable mHealth interventions can be developed to effectively support teenagers in managing their HIV/AIDS condition and improving their overall well-being.

2.6 Research Gaps

There is a need for empirical studies that comprehensively characterize the utilization of mHealth services by teenagers living with HIV/AIDS in island communities of Lake Victoria. This research should focus on understanding the extent to which teenagers

have access to mobile phones, smartphones, and internet connectivity, as well as their digital literacy levels (Awiti et al., 2016). Additionally, exploring the specific mHealth interventions or platforms that teenagers in these communities engage with, including text-messaging interventions, mobile apps, and social media platforms, would provide insights into their preferences and needs (Deloitte, 2012; Lee et al., 2018).

Investigating the impact of technological obsolescence on mHealth access and utilization among teenagers living with HIV/AIDS in island communities is crucial. Research could explore how factors such as the rapid turnover of mobile phone models, software updates, and discontinuation of older devices affect teenagers' ability to access and benefit from mHealth services (LeBlanc et al., 2013). Understanding how technological obsolescence exacerbates disparities in access to treatment and healthcare information among teenagers in resource-constrained island communities is essential for developing strategies to mitigate these challenges.

Examining the sustainability of community-based health support systems for teenagers living with HIV/AIDS in island communities is a critical research gap. This research could assess the effectiveness of existing community support structures, such as peer support groups, community health workers, and local healthcare facilities, in providing ongoing support and adherence to treatment among teenagers (Gibbs et al., 2015). Additionally, exploring the challenges and opportunities for sustaining these support systems in the face of socio-economic, cultural, and environmental factors unique to island communities would inform the development of targeted interventions.

Investigating knowledge management practices within island communities related to HIV/AIDS treatment and mHealth utilization is an important research area. This research could explore how teenagers living with HIV/AIDS access, share, and apply health-related information through mobile technologies, social networks, and community-based initiatives (SY, 2008). Understanding the role of knowledge management in promoting treatment adherence, reducing stigma, and improving health

outcomes among teenagers in island communities would contribute to the design of effective mHealth interventions and support systems.

CHAPTER THREE

METHODOLOGY

This section considers research design which factors in mixed method survey and applies both qualitative and quantitative techniques, the study area - Ringiti, Remba, Rusinga, Mfangano and Mageta islands, the target population of teenagers who have tested HIV positive and the sampling for teenagers registered support groups facilitated by government hospitals, and access mobile phones. This section also looks into analysis on matters treatment access by teenagers living with HIV/AIDS on mHealth. This section also focuses on how the study utilized multiple linear regression analysis to examine assumptions of normality, homoscedasticity, outliers, linearity, autocorrelation, and multicollinearity.

3.1 Research Design

Cross-sectional study design, operationalized as a field survey, was used to demonstrate relationships (Kothari, 2004), and describes the effect of mHealth utilization on access to treatment by teenagers living with HIV/AIDS in island communities of Lake Victoria. Cross-sectional research offers a significant advantage through cross-case analysis, focusing on generalized relationships between distinct elements and conditions. It establishes general models and tests theories (Spector, 2019). Using a significant sample of a population of targeted teenagersto estimate the relationship (Ethridge, 2004), the descriptive cross-sectional survey provided information about the naturally occurring health status, behavior, attitudes or other characteristics (Shields, Patricia & Rangarajan, 2013). Integrating quantitative and qualitative research facilitates broader access to research areas of interest. Quantitative research is efficient at focusing on structural features, while qualitative studies are stronger in processual aspects, often involving participant observation, interviews, focus groups, and language-based techniques (Ahmad et al., 2019). Applying both qualitative and quantitative research techniques (Shields *et al.*, 2013), the survey method related mHealth access to: number of referrals,

number of teenagers initiated on ART, and number of teenagers adhering to treatment. The study employed the probit model for the anticipated binary response in utilization of mHealth and access to treatment.

3.2 Study Area

The study was carried out in islands of Lake Victoria that is, Ringiti, Remba, Rusinga, Mfangano and Mageta, which lie in the eastern part of Lake Victoria, in Kenya. The choice of the study area was based on (i) poor health indices affecting the teenagers in the regions (i.e., HIV/AIDS, Malnutrition, Unwanted and Unplanned Pregnancies, Termination of Pregnancies, Sexually Transmitted Infections – KHDS, 2014) and (ii) low provision of health care services (KAIS, 2014) due to the detachment from mainland and limited investment in healthcare infrastructure.

3.3 Target Population

The population study was teenagers (13 to 19 years) who have: (i) tested HIV positive, (ii) are in registered support groups facilitated by government hospitals, and (iii) have personal mobile phones or can access one at household level. It is estimated that 9,420 children living with HIV in the County (Kenya HIV estimates 2015).

3.4 Sample Frame

This study focused on teenagers living with HIV/AIDS and are on mHealth; and a control of the same who are not on mHealth. By examining the differences between these two groups, this research identified the benefits and challenges associated with mHealth interventions in this population, ultimately helping to inform and improve future healthcare strategies for adolescents with HIV/AIDS. As of July 2017, a total of 409 were registered (using unique identification codes) at various comprehensive care clinics across the five islands; this is the target population size.

3.5 Sample and Sampling Technique

The sample size for this study was estimated using the following statistical sample determination formulae below by William G. Cochran:

$$n = \frac{X^2 * N * P * (1 - P)}{(ME^2 * (N - 1)) + (X^2 * P * (1 - P))}$$

where:

n = sample size

X^2 = Chi-square for the specified confidence level at 1 degree of freedom

N = population size

P = Population proportion (.50)

ME = desired margin of error (expressed as a proportion).

therefore:

N is approximately 409 (from health facility records – as of July 2017)

P=0.5**ME**=5% (0.05) $\mathbf{X^2}$= 3

$$n = \frac{3*409*0.5(1-0.5)}{(ME^2*(409-1))+(3*0.5*(1-0.5))} = n = 173.30508475$$

n= 173.30508475 as sample of teenagers living with HIV. This is approximately 173.

Due to the nature of the study, that is, its sensitivity and inclusion criterion, the study worked with teenage support groups. Working with teenage support groups for HIV/AIDS study in sensitivity settings offers a safe, understanding environment for young individuals, focusing on emotional support and ensuring a match between needs and help offered. Working with teenage support groups to study HIV/AIDS in a sensitivity setting is important because it provides a safe and understanding environment for young individuals who may be more hesitant to discuss such sensitive topics

(Camaraet al. 2017). By engaging with these groups, researchers gain valuable insights into the unique challenges and perspectives of teenagers affected by HIV/AIDS, ultimately leading to more targeted and effective strategies for prevention, education, and support. Additionally, involving teenagers in the research process can empower them to become advocates for themselves and their peers, breaking down stigma and promoting open dialogue about HIV/AIDS within their communities. At level one, through government local health facilities, willing Health Workers engaged teenagers living with HIV at the comprehensive clinics were identified and requested to participate in the study as guides and link creators.

In turn, the health workers introduced the research and researcher to existing support groups, where they were engaged as key informants, interviewees for structured questionnaire and members of a focus group discussion. At level two, stratified random sampling was applied to ensure each stratum was taken in a number proportional to the stratum's size as compared to the population. A control group was introduced to measure any differences in access to treatment between users and non-users of mHealth. At level three, members that formed a control group to help eliminated the influence of some extraneous factor (Campbell & Stanley, 1963); 30 percent of the sample size will apply as illustrated below. The control group were teenagers (13 to 19 years) who have tested HIV positive, are in registered support groups facilitated by government hospitals, but have no access to personal mobile phones or any at the household level.

Table 3.1: Study sample size

Islands	**Approximated population of teenagers living with HIV on care and treatment (*N* = 409)**	**Proportion to total population (%)**	**Sample size (*n* = 173)**	**Control Group sample (30% of *n*)**
Ringiti	39	9.535	16.496	4.9488
Rusinga	133	32.518	56.256	16.8768
Mfangano	114	27.873	48.22	14.4660
Remba	22	5.379	9.306	2.7918
Mageta	101	24.694	42.721	12.8163
Total	**409**	**100**	**172.998**	**51.8997**

3.6 Data Collection Instruments

This study used questionnaire, focus group discussion guide, and key informant interview guide as tools for data collection. The questionnaire was developed in tandem with the teenagers in mind, that is, to ensure it does not present subjective and judgmental language. Filled partly by teenagers living with HIV/AIDS on mHealth, questionnaire was structured to deduce patterns, frequency, needs, expectations, perspectives, priorities and preferences, shifts in user attitudes and opinions, and emerging trends. As propounded by Kothari (2004), important is the analysis of information provided that helped clarify directions, question wording, and response categories. A second part will be filled by care givers of teenagers living with HIV/AIDS on mHealth, who responded to policy aspects.

Focus Group Discussion (FGD) guide was administered to select teenagers living with HIV/AIDS on mHealth. A total of three FGDs were held with a maximum of 10 per session. These sessions provided insight to group thinking on access to information via mHealth and equally offer immediate ideas for the improvement of the questionnaire.

To incorporate views of opinion leaders, Key Informant Interviews (KII) was done for 15 interviewees: three each island. KIIs helped explore in depth with potential discoveries of information that would otherwise not have been revealed in the survey. The study considered ethical issues in planning and conducting the entire research, as well as in reporting research findings. It (the study) protected and ensured the dignity and welfare of all participants as well as those who may have been affected by the results of the research project by not documenting their official names but by use of codes. This obligation also entailed protecting them from harm, unnecessary risks, or mental and physical discomfort that may be inherent in the study procedure (APA, 1992).

3.6.1 Reliability

Questionnaire for the study was subjected to a reliability check. Reliability is broadly defined as the degree to which measures are free from error and therefore yield consistent results (Thanasegaran, 2009). Kurpiusand Stafford (2006) defines reliability as the trustworthiness or accuracy of measurement of a research instrument. Reliability is concerned with the ability of an instrument to measure consistently. Also, piloting data collection, to further test reliability, the researcher carried out random pre-test to 15 respondents (in one of the islands) - to confirm if results obtained were similar.

3.7 Data Analysis and Presentation

Analyzing qualitative and quantitative data involved distinct yet complementary approaches tailored to the nature of the data. Qualitative data analysis typically begins with immersion, where researchers immerse themselves in the data through repeated readings or listening sessions. Following this, researchers proceed to code the data, identifying themes, patterns, or concepts and assigning codes to them. These codes were then categorized, allowing researchers to develop a conceptual framework that organizes and makes sense of the data. Through interpretation, relationships between categories are examined, key findings are identified, and conclusions are drawn. Validation techniques, such as member checking or triangulation, ensure the credibility of findings. The qualitative data was analyzed by use of the NVIVO.

Conversely, quantitative data analysis started with cleaning the data, identifying and rectifying any errors or inconsistencies. Descriptive statistics were then applied to summarize the main features of the dataset, providing insights into central tendency, variability, and distribution. Inferential statistics were subsequently employed to make inferences or predictions about a population based on sample data. Techniques such as hypothesis testing or regression analysis help determine the significance of relationships within the data. Data visualization played a crucial role in presenting the findings visually through graphs, charts, or tables, aiding in interpretation and communication.

Finally, conclusions are drawn considering factors like statistical significance and effect size. The quantitative data was analyzed by use of SPSS.

3.7.1 Testing Assumptions of Multiple Linear Regression Analysis

The assumptions for linear regression analysis include: the dependent variable is normally distributed; the relationship between each of predictor variables and the dependent variable is linear; the dependent variable exhibits variance across a range of independent variables; no multicollinearity, singularity and outliers.

Test of normality was done by inspecting the output of the normal Q-Q plot for the dependent variable (Tabachnick & Fidell, 2007; Pallant, 2010). Homoscedasticity was examined by generating a scatter diagram of the dependent variable (Pallant, 2010). Outliers were inspected by use of box plot that will be generated from the dataset using SPSS V23.0 software. Outliers are cases that have standardized residual of more than 3.3 or less than -3.3 (Tabachnick & Fidell, 2007).

Linearity was tested by using correlations among variables and by generating scatter plots from the SPSS V23.0 dataset. Curvillinear estimation was used for easier observation of a linear relationship between the predictor and the dependent variable (Mertler & Reinhart, 2016). Autocorrelation was tested using Durbin-Watson test. According to Gujarati (2014), Durbin-Watson statistic ranges from 0 to 4. A value near 0 indicates presence of positive autocorrelation while a value close to 4 indicates presence of negative autocorrelation. A value ranging from 1.5 to 2.5 indicates that there is no presence of autocorrelation between the variables.

Multicollinearity was tested by generating a table from the SPSS V23.0 dataset. The aim was to see the intercorrelations among all pairs of predictors and determine whether multicollinearity is likely to be a problem (Allison, 2012). In case of any presence of multicollinearity, Alin (2010) recommends combining the variables into a composite variable or deleting one or more of the highly correlated (Tolerance levels at 0.6 and

above) variables. Tolerance refers to the amount of variability of the selected independent variable not explained by other independent variables, while VIF is the inverse of tolerance value. According to Cohen *et al.* (2013), the suggested cut-off point for multicollinearity is tolerance level of 0.8. Also, Hair *et al.* (2014) and O'brien (2007) proposed a cut-off point for determining presence of multicollinearity at a tolerance value of less than 0.10, or a VIF of above 10.

3.7.2 Model Estimation

Multiple Linear Regression Analysis was used to estimate the effect of the independent variables on the dependent (Treatment Access) and provide a means of objectivity in assessing the degree and nature of the relationship between the dependent and independent variables. Further, Analysis of Variance (ANOVA) was carried out to test the significance of the models. The decision rule for F-statistic is to accept the model if p-value is smaller or equal to the critical value of 0.05 level of significance or to reject the model if p-value is greater than the critical value 0.05 level of significance (Hocking, 2013).

According to Darlington and Hayes (2016), regression analysis is a statistical tool for the investigation of relationships between variables. Multiple regression analysis involves combining several predictor variables in a single regression equation. Multiple linear regressions are used where the independent (Predictor) variables are more than one and the multiple regression assumptions (Discussed above) are met by the data being analyzed.

The study was guided by a model of the form:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where:

Y = Represents the dependent variable (Treatment Access – measured by Y_1 number of referrals made teenager on mHealth, Y_1 number of teenagers on mHealth initiated on ART, Y_1number of teenagers on mHealth adhering to treatment.

β_0 = The Constant, the value of *Y* when all *X* values are zero.

β_i = The regression coefficients (*i = 1, 2, 3and 4*). The regression coefficients indicate the relative importance of each of the independent variables in prediction of the dependent variable.

X_i = The independent variables (*i = 1, 2, 3and 4*), will explain the variation in the dependent variable (Treatment Access). In this case:

X_1= Characterization of mHealth users (as measured by X_1 Age, X_2 Household status, X_3 type of phone accessed, X_4 information site sought, X_5 duration of usage, X_6 purchase of bundles)

X_2= Knowledge management (as measured by X_1 content contribution, X_2 content modification, X_3content sharing, X_4 information flow structure, X_5 messaging, X_6 feedback mechanisms, X_7 culture specific, X_8 culture responsive, X_9 interoperability, X_{10} scalability, X_{11} replicability)

X_3 = Technology obsolescence (as measured by X_1 frequency of purchase, X_2 mHealth content, X_3 discontinuance suggestion)

X_4 = Sustainability (as measured by X_1 inclusion at the conceptualization stage, X_2 inclusion of health facilities, X_3 inclusion of religious organization, X_4 inclusion of schools, X_5 mHealth financing by individual, X_6 mHealth financing by community, X_7mHealth financing by county budget)

ε = the error term (To account for all other Variables not considered in this study), assumed to be normally distributed with mean zero and constant variance.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the key findings of the study that sought establish the Effect of mHealth Utilization on access to treatment by teenagers living with HIV/AIDS in Island Communities of Lake Victoria. The findings with regard to the response rate and study sample characteristics are presented first. The areas of discussions are findings on how teenagers living with HIV utilization mHealth are characterized, the knowledge management of mHealth information by the teenagers, effect of technology obsolescence on the utilization of mHealth information by teenagers living with HIV from the island communities of Lake Victoria and its effect on treatment access. In this study, regression analysis generated an equation to describe the statistical relationship between one or more predictor variables and the response variable.

4.2 Response Rate

Questionnaires were issued to a sample of 173 respondents domiciled in Ringiti, Remba, Mfangano, Rusinga and Mageta all lying in the eastern part of Lake Victoria, Kenya. A total of 138 questionnaires were received back, giving a response rate of 80.2% which the study considered adequate for the purposes of analysis. According to Mugenda and Mugenda (2012), a response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a response rate of 70% and over is excellent. Based on the assertion, the response rate was excellent and, therefore, representative and satisfactory to make conclusions for the study. This collaborates with the assertion by Brymann and Bell (2015) that a response rate of 50% is adequate, while a response rate greater than 70% is very good.

The highest response rate was received from Rusinga at 31.2%, followed by Mageta at 28.3%, Mfangano at 26.8%, Ringiti at 9.4% and lastly Remba at 4.3 % of the total returned questionnaires. Also, the study issued and administered a total of 45 questionnaires to the control group of respondents domiciled in Ringiti, Remba, Mfangano, Rusinga and Mageta and all the respondents gave their feed backs implying 100% response rate. The various health facilities accessed by teenagers as point of care were Sena (23.5%), Mageta Health Centre (22.8%), Ugina (26.3%), Wakula (22.3%), and Nyakweri (5.1%). The study also sought for information from key informants. A total of 15 opinion leaders, were targeted, 11 accepted interviews which explore in depth issues that were otherwise not known to teenagers, thus, could not be revealed by the questionnaire.

The response rate in the study conducted in Ringiti, Remba, Mfangano, Rusinga, and Mageta, communities lying in the eastern part of Lake Victoria, Kenya, is significant in assessing the effectiveness of mHealth utilization on access to treatment by teenagers living with HIV/AIDS in island communities. A response rate of 80.2% indicates a high level of engagement and willingness among respondents to participate in the study, suggesting a strong interest in the topic and potentially reflecting the importance of mHealth in these communities. This high response rate enhances the reliability and validity of the findings, as it reduces the likelihood of non-response bias and ensures that the data collected are representative of the target population (Mugenda & Mugenda, 2012).

The comprehensive nature of the response rate, covering various communities and health facilities, provides a holistic understanding of mHealth utilization and access to treatment among teenagers living with HIV/AIDS in the island communities of Lake Victoria. By including both questionnaires and interviews with key informants, the study captures a diverse range of perspectives and experiences, allowing for a nuanced analysis of the factors influencing mHealth utilization and access to treatment. Additionally, the 100% response rate from the control group reinforces the robustness of the study's methodology and strengthens its ability to draw meaningful conclusions

regarding the effectiveness of mHealth interventions in improving healthcare outcomes for teenagers living with HIV/AIDS in the region.

Overall, the high response rate in the study underscores the importance of understanding the role of mHealth in facilitating access to treatment and healthcare services among teenagers living with HIV/AIDS in island communities. By providing insights into the utilization patterns, challenges, and opportunities associated with mHealth interventions, the study contributes valuable information for the development and implementation of targeted strategies to improve healthcare delivery and support for this vulnerable population

4.3 Sampling Adequacy Tests

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity are statistical techniques used to assess the suitability of data for conducting factor analysis. In this analysis, KMO values range from 0 to 1, with higher values indicating better suitability for factor analysis. A KMO value above 0.5 is generally considered acceptable, while values closer to 1 indicate a high degree of suitability. Across the different domains studied, including mHealth users, knowledge management, technology obsolescence, community obsolescence, and access to treatment, the KMO values are all relatively high, ranging from 0.754 to 0.832. These values suggest that the data collected for each domain are highly suitable for factor analysis, indicating that there is sufficient common variance among the variables to proceed with the analysis. The high KMO values imply that there is a sufficient amount of common variance among the variables within each domain, indicating that the collected data capture a comprehensive range of factors relevant to mHealth utilization and access to treatment. This suggests that interventions designed to enhance mHealth utilization and access to treatment should address multiple dimensions, including technological accessibility, knowledge dissemination strategies, and community-level support mechanisms

Additionally, Bartlett's Test of Sphericity assesses whether the correlation matrix is an identity matrix, which would indicate that the variables are unrelated and unsuitable for factor analysis. A significant result ($p < 0.05$) suggests that the variables are sufficiently correlated to proceed with factor analysis. In this case, all domains show a significant result with p-values of 0.000, indicating that the correlations between variables within each domain are significant, further supporting the suitability of the data for factor analysis. The significant results of Bartlett's Test of Sphericity across all domains have several implications for the study on the effect of mHealth utilization on access to treatment by teenagers living with HIV/AIDS in island communities of Lake Victoria. Firstly, the high suitability of the data for factor analysis suggests that the collected data provide a reliable basis for understanding the factors influencing mHealth utilization and access to treatment among teenagers in these communities. This implies that the findings derived from the subsequent factor analysis are likely to be robust and trustworthy.

Overall, the high KMO values and significant results of Bartlett's Test of Sphericity across all domains suggest that the data collected for each domain are highly suitable for conducting factor analysis. This provides confidence in the validity of the subsequent factor analysis and the ability to draw meaningful conclusions about the underlying factors influencing each domain, such as mHealth usage, knowledge management practices, technology and community obsolescence, and access to treatment for individuals living with HIV/AIDS..

Table 4.1: KMO and Bartlett's Test

	KMO and Bartlett's Test		
Characterization of mHealth Users	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.754
	Bartlett's Test of Sphericity	Approx. Chi-Square	2683.540
		Df	138
		Sig.	.000
Knowledge management	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.822
	Bartlett's Test of Sphericity	Approx. Chi-Square	2076.324
		Df	138
		Sig.	.000
Technology Obsolescence	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.815
	Bartlett's Test of Sphericity	Approx. Chi-Square	2087.678
		Df	138
		Sig.	.000
Community Obsolescence	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.832
	Bartlett's Test of Sphericity	Approx. Chi-Square	1987.876
		Df	138
		Sig.	.000
Access to treatment	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.789
	Bartlett's Test of Sphericity	Approx. Chi-Square	2098.989
		Df	138
		Sig.	.000

4.4 Factor Analysis

Factor analysis was used to summarize data to be more manageable without losing any important information and, therefore, making it easier to test hypothesis (Field, 2009; Tabachnik & Fidell, 2007). According to Field (2009), there are three main reasons for using factor analysis including to develop a scale to measure variables, reduce the variables to a manageable size and to have a better understanding of the variables. According to Cooper & Schindler (2011), factor analysis is a technique used for specific computational techniques. These factors, also called latent variables, aim to measure things that are usually hard to measure directly, such as attitudes and feelings (Field,

2009). It is a way of explaining the relationship among variables by combining them into smaller factors (Zikmund, 2010). The scales usually start with many questions, and then by using factor analysis are reduced to smaller number (Pallant, 2011). The reduced results are then used for other analysis such as multiple regression analysis. Factors are a smaller set of underlying composite dimensions of all the variables in the data set while loadings are the correlation coefficients between the variables and the factors (Mugenda & Mugenda, 2012).

Factor loading assume values between zero and one of which loadings of below 0.30 are considered weak and unacceptable (Nachmias & Nachmias, 2008).Tavakol & Dennick (2011) provided for more stringent conditions and cut offs starting from 0.32 (Poor), 0.42 (fair), 0.55 (good), 0.63 (very good) and from 0.71 (excellent).Variables that have a factor loading of 0.4 or greater within a particular factor are considered to be its major components and has been used by other researchers such as Kline (2015) and Field (2009). The method has been widely accepted as reliable for factor analysis (Byrne, 2016; Kline, 2014; Field, 2009).

In their study, Konyango, Ngugi, Rotich and Orwa (2019) described factor loading values that are greater than 0.4 as acceptable and values below 0.4 should lead to collection of more data to help researcher to determine the values to include. Values between 0.5 and 0.7 are commonplace, values between 0.7 and 0.8 are good, values between 0.8 and 0.9 are great, and values above 0.9 are superb. The current study used factor loading values that are greater than 0.4 as acceptable benchmark. The findings presented in Table 4.2 shows the overall factor analysis for all the variables that is the four factors measuring the independent variables and dependent variables. Characterization of mHealth Users had six items with factor loadings of 0.773. All the items were accepted based on the general rule of thumb for acceptable factor loading of 0.40 and above. No item was removed or expunged. The result of the factor analysis for Knowledge management which had six items recorded a factor loading of 0.768. This implies that all items fall within the acceptable threshold based on the general rule of thumb and none of the items was dropped. The factor analysis for Technology

obsolescence, with six items showed factor loadings of 0.699. Since all the loadings were above 0.40, no factor was eliminated because they met the acceptable threshold.

For Community Support, there were six items out of which none was dropped for consistency as the factor loading was 0.711. The factor analysis for community support, with six items showed factor loadings of 0.795. Since all the loadings were above 0.40, no factor was eliminated because they met the acceptable threshold. The dependent variable access to treatment was also subjected to factor analysis. All the factor loadings were 0.765 which implies that all items fall within the acceptable threshold as no item was dropped. It indicates that all the factor loading of all the items were above 0.4 and thus all were considered for further statistical analysis.

Table 4.2: Summary of Factor Analysis

Variable	Number of Items	Factor Loadings
Characterization of mHealth users	20	.773
Knowledge management	20	.768
Technology Obsolescence	6	.699
Community Support	22	.711
Access to treatment	4	.795

4.5 Demographic Information

The study sought to find out the demographic characteristics of the respondents based on question 1-6 of section one in the questionnaire. The distribution of the respondents was per age, gender, head of household, when infected with HIV, year diagnosed with HIV and drug regiment status. The results, as indicated in Table 4.4 below, show most of the teenagers interviewed were between ages 12 and 14, at 59.5% and 57.8% for case and control groups respectively. Those aged 18 and 20 were at 15.6% and 11.1% for case and control groups respectively. This indicated that majority of teenagers living with HIV/AIDS in Island Communities of Lake Victoria were aged between 12 to 14 years old.

The findings revealing that the majority of teenagers living with HIV/AIDS in Island Communities of Lake Victoria are between the ages of 12 to 14 have significant implications for the effectiveness of mHealth utilization on access to treatment. Understanding this age distribution underscores the need for tailored interventions that address the unique developmental, psychosocial, and healthcare needs of adolescents in this age group. Early intervention strategies targeting younger teenagers can mitigate disease progression, reduce transmission risk, and promote long-term health outcomes. Engaging guardians, caregivers, and support networks in the treatment process, as facilitated by mHealth platforms, is essential for comprehensive care delivery. Moreover, creating adolescent-friendly healthcare services that prioritize confidentiality, accessibility, and sensitivity to adolescents' preferences and experiences is critical for overcoming barriers to treatment access. Overall, targeted and age-appropriate mHealth interventions have the potential to enhance treatment adherence and improve health outcomes among teenagers living with HIV/AIDS in Island Communities of Lake Victoria.

Regarding the sex of the respondents for both case and control categories, the females were 74% while 64% were males interviewed. The study results indicated that most of the teenagers living with HIV/AIDS in Island Communities of Lake Victoria were female. The predominance of female respondents among teenagers living with HIV/AIDS in Island Communities of Lake Victoria, with females comprising 74% of the cases and 64% of the control group, underscores the gender disparities in HIV prevalence and access to healthcare services in this region. This finding suggests a need for targeted interventions that address the specific challenges faced by young females, such as gender-based violence, socio-cultural norms affecting healthcare-seeking behavior, and unequal access to education and resources. Efforts to improve access to HIV testing, treatment, and support services should prioritize gender-sensitive approaches that empower young females to overcome barriers to care and mitigate the disproportionate burden of HIV/AIDS on this demographic group. Additionally, addressing broader social determinants of health, including poverty, gender inequality,

and lack of comprehensive sexuality education, is essential for reducing HIV transmission and improving health outcomes among adolescent females in Island Communities of Lake Victoria.

Pertaining to the need to establish the nature of home leadership that these teenagers came from, the results in Table 4.3 below indicate that of the case category, a majority at 58.7% came from single-parent headed households; with single mothers at 50% and fathers at 8.7%. Those who came from child-headed (below 18 years) households were 11.8%. The study results teenagers living with HIV/AIDS in Island Communities of Lake Victoria majority of them belong to single-parent headed households. The prevalence of single-parent headed households among teenagers living with HIV/AIDS in Island Communities of Lake Victoria, with 58.7% of cases originating from such households, underscores the complex socio-economic challenges faced by this vulnerable population. This finding suggests that many of these teenagers may lack adequate familial support and stability, which can significantly impact their access to healthcare services, including mHealth interventions. Single-parent households, particularly those led by single mothers, may face additional financial and social barriers that hinder access to HIV/AIDS treatment and support. Therefore, efforts to improve mHealth utilization and access to treatment for teenagers living with HIV/AIDS in these communities should take into account the unique family dynamics and socio-economic contexts, offering targeted support and resources to address the specific needs of individuals from single-parent households. Additionally, interventions aimed at strengthening family support networks and enhancing parental involvement in adolescents' healthcare decision-making may contribute to improved health outcomes and treatment adherence among this vulnerable population

In addition, the data on when teenagers living with HIV/AIDS in Island Communities of Lake Victoria were infected provides crucial insights into the nature of HIV transmission in this region. A significant majority of the respondents, 67.4% in the case group and 75.6% in the control group, were infected at birth. This high rate of vertical transmission underscores the urgent need for robust prevention measures during

pregnancy, delivery, and breastfeeding. Preventing mother-to-child transmission (PMTCT) programs should be strengthened, ensuring that pregnant women have access to antiretroviral therapy (ART) and comprehensive prenatal care. Additionally, improving the awareness and education of expectant mothers about HIV transmission risks and prevention methods is vital. These steps are essential in reducing the transmission rates and addressing the root causes of HIV spread in these island communities. The implications of these findings highlight the necessity for increased investment in maternal and child health services, particularly in enhancing the coverage and effectiveness of PMTCT programs. This can significantly reduce the incidence of vertical transmission, leading to better health outcomes for future generations.

On the other hand, 32.6% of the case group and 24.4% of the control group acquired HIV after birth, pointing to significant postnatal risk factors. These could include unprotected sexual activities, inadequate health education, and lack of access to preventive healthcare services. This highlights the need for targeted interventions that address these specific risk factors among teenagers. Comprehensive sexual education programs, widespread availability of condoms, and increased access to healthcare services are critical components of these interventions. Moreover, mHealth utilization can play a pivotal role in bridging the gap in healthcare access, providing teenagers with reliable information on HIV prevention, treatment adherence, and available support systems. By leveraging mobile health technologies, it is possible to enhance the reach and effectiveness of HIV prevention and treatment programs, thereby improving health outcomes for teenagers living with HIV/AIDS in the Lake Victoria Island communities. The implications here suggest that integrating mHealth solutions into existing healthcare frameworks can empower teenagers with the knowledge and resources they need to protect themselves from HIV and manage their condition more effectively.

The data on the year of first HIV diagnosis among teenagers living with HIV/AIDS in Island Communities of Lake Victoria reveals several key trends and implications for public health interventions. The distribution shows that diagnoses have been relatively spread out over the years, with notable peaks and troughs. Specifically, the highest

number of diagnoses in the case group occurred between 2014 and 2016 (29.7%), followed by 2011 to 2013 (28.3%), and the period from 2017 to 2019 (19.6%). In the control group, the highest number of diagnoses occurred most recently, from 2017 to 2019 (28.9%), followed by 2008 to 2010 (24.4%), and 2011 to 2013 (22.2%). These trends indicate that while there have been periods with higher diagnosis rates, recent years continue to see a significant number of new diagnoses, suggesting ongoing transmission risks and possibly increased detection efforts.

The implications of these findings are multifaceted. First, the high number of recent diagnoses, particularly from 2017 to 2019, suggests that despite existing prevention efforts, new infections are still occurring at a notable rate. This underscores the need for continuous and enhanced HIV prevention programs, particularly targeting the youth in these island communities. This could involve scaling up education and awareness campaigns, promoting safer sexual practices, and ensuring better access to preventive measures like condoms and pre-exposure prophylaxis (PrEP). Additionally, it is crucial to investigate and address the underlying factors contributing to these new infections, such as socioeconomic conditions, cultural practices, and gaps in healthcare delivery.

Moreover, the distribution of diagnoses over the years highlights the importance of sustained support for those living with HIV. As individuals are diagnosed at different times, their needs for treatment, counseling, and support services will vary. For instance, those diagnosed earlier may be facing issues related to long-term treatment adherence and managing potential side effects, while those diagnosed more recently might need more immediate support in terms of understanding their condition and starting treatment. The findings imply that healthcare systems need to be adaptive and responsive to the diverse and evolving needs of teenagers living with HIV/AIDS. This includes integrating mHealth solutions to provide continuous education, reminders for medication adherence, and virtual counseling to ensure that all individuals, regardless of when they were diagnosed, receive consistent and personalized care. By doing so, it is possible to improve overall health outcomes and quality of life for teenagers living with HIV in these communities.

The data on drug regimen status for teenagers living with HIV/AIDS in the Island Communities of Lake Victoria shows that 47.8% of the case group and 48.9% of the control group have had their drug regimen changed to a second or third line of treatment. Conversely, 52.2% of the case group and 51.1% of the control group are still on their first line of treatment. This near-equal distribution between those who have had their treatment regimens changed and those who have not suggests that a significant proportion of teenagers are experiencing treatment challenges that necessitate changes in their medication. The implications of these findings are significant for healthcare providers and policymakers. The fact that almost half of the teenagers have had their drug regimens changed indicates issues related to drug resistance, side effects, or suboptimal treatment efficacy. This highlights the need for continuous monitoring and individualized treatment plans to manage these complexities effectively. Healthcare providers must be vigilant in detecting early signs of treatment failure and making necessary adjustments to prevent further complications. This may involve regular viral load testing, resistance testing, and comprehensive support to ensure adherence to the new regimens.

Moreover, the substantial proportion of teenagers still on their first line of treatment suggests that for many, the initial treatment regimen is effective. However, to maintain this effectiveness, ongoing support and monitoring are crucial. The findings imply that there is a need for robust mHealth interventions to support treatment adherence and management. mHealth solutions can provide regular reminders, educational resources, and virtual support groups, which can be particularly beneficial in resource-limited settings like the Lake Victoria islands. By leveraging technology, healthcare providers can ensure that teenagers receive timely support and interventions, potentially reducing the need for regimen changes and improving overall treatment outcomes. Additionally, understanding the factors leading to regimen changes can help in developing more effective first-line treatments and preventing the emergence of drug resistance.

Table 4.3: Demographic Information of Teenagers Living with HIV/AIDS on mHealth

Characteristic	Case		Control	
	n = 138	%	n = 45	%
Age (in years)				
12 – 14	83	59.5	26	57.8
15 – 17	34	24.9	14	31.1
18 – 20	21	15.6	5	11.1
Sex				
Male	64	46.4	20	44.4
Female	74	53.6	25	55.6
Head of household				
Single parent alive (Mother)	69	50.0	9	20.0
Parents alive (Both Mother & Father)	45	32.6	30	66.7
Single parent (Father)	12	8.7	2	4.4
Relatives (Uncles, Aunts, Cousins)	8	5.8	0	0.0
Child headed (Below 18 years)	4	2.9	5	8.9
When infected with HIV				
At birth	93	67.4	34	75.6
Acquired after birth	45	32.6	11	24.4
Year first diagnosed with HIV				
2005 – 2007	16	11.6	5	11.1
2008 – 2010	15	10.9	11	24.4
2011 – 2013	39	28.3	10	22.2
2014 – 2016	41	29.7	6	13.3
2017 – 2019	27	19.6	13	28.9
Drug regiment status				
Changed (on 2nd or 3rd line of treatment)	66	47.8	22	48.9
Not Changed (still on 1st line of treatment)	72	52.2	23	51.1

4.6 Diagnostic Tests

The study used descriptive and inferential analysis model due to its ability to show relationships between the independent and the dependent variables (Castillo, 2009). Classic linear regression model has important underlying assumptions that must be tested before it can be utilized as a model of data analysis and hence the researcher embarked on the exercise. The key assumptions affecting the study are discussed herein.

4.6.1 Normality Test

The Kolmogorov-Smirnov and Shapiro-Wilk tests are statistical tests used to assess the normality of a distribution. The results for each variable in this study are as follows:

For "Characterization of mHealth Users," the Kolmogorov-Smirnov test yielded a statistic of 0.152 with a significance value of 0.078, and the Shapiro-Wilk test yielded a statistic of 0.944 with a significance value of 0.834. Both significance values are greater than 0.05, indicating that the distribution of data for "Characterization of mHealth Users" is approximately normal. This normality suggests that parametric statistical tests can be used to analyze this data, enhancing the reliability and validity of the findings.

For "Knowledge Management," the Kolmogorov-Smirnov test yielded a statistic of 0.209 with a significance value of 0.092, and the Shapiro-Wilk test yielded a statistic of 0.918 with a significance value of 0.921. The results indicate that the data for "Knowledge Management" is also approximately normally distributed. This allows for the application of parametric tests, which are more powerful and robust than non-parametric tests when the normality assumption is met.

For "Technology Obsolescence," the Kolmogorov-Smirnov test yielded a statistic of 0.154 with a significance value of 0.32, and the Shapiro-Wilk test yielded a statistic of 0.956 with a significance value of 0.095. Since the significance values for both tests are above 0.05, the distribution of "Technology Obsolescence" does not significantly deviate from normality. This normal distribution supports the reliability of any analyses conducted on this variable.

For "Community Support," the Kolmogorov-Smirnov test yielded a statistic of 0.214 with a significance value of 0.233, and the Shapiro-Wilk test yielded a statistic of 0.892 with a significance value of 0.092. The results indicate that the data for "Community Support" is approximately normal. This enhances the validity of the study's findings and supports the use of parametric statistical methods in further analyses.

For "Access to Treatment," the Kolmogorov-Smirnov test yielded a statistic of 0.166 with a significance value of 0.992, and the Shapiro-Wilk test yielded a statistic of 0.942 with a significance value of 0.850. The high significance values indicate that the data is normally distributed. This normality suggests that the sample adequately represents the population, allowing for generalizations and inferences to be made with greater confidence.

The implications of these findings are significant for the study of mHealth utilization and access to treatment for teenagers living with HIV/AIDS in the Island Communities of Lake Victoria. The normal distribution of the data across these variables allows for the use of more powerful parametric statistical tests, which can lead to more accurate and reliable insights. For instance, understanding the characterization of mHealth users can help in designing more effective mHealth interventions tailored to the specific needs of the target population. Additionally, the normal distribution of data related to knowledge management and technology obsolescence can inform strategies to enhance digital literacy and ensure that mHealth tools remain accessible and relevant.

Moreover, the normal distribution of community support data emphasizes the importance of fostering strong community networks to support teenagers living with HIV/AIDS. Finally, the normal distribution of access to treatment data supports the development of standardized protocols and practices to improve treatment adherence and health outcomes. Overall, the normality of these variables supports the robustness of the study’s findings and facilitates the application of advanced statistical techniques to derive meaningful and actionable insights for improving mHealth interventions in these communities..

Table 4.4: Normality Tests

Variable	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Characterization of mHealth	0.152	202	0.078	0.944	202	0.834
Knowledge Management	0.209	202	0.092	0.918	202	0.921
Technology Obsolescence	0.154	202	0.32	0.956	202	0.095
Community Support	0.214	202	0.233	0.892	202	0.092
Access to treatment	0.166	202	0.992	0.942	202	0.850

4.6.2 Test for Multicollinearity

The collinearity statistics for the model assessing the impact of various factors on access to treatment for teenagers living with HIV/AIDS in the Island Communities of Lake Victoria indicate that multicollinearity is not a significant issue. Tolerance values above 0.1 and VIF (Variance Inflation Factor) values below 10 are generally considered acceptable thresholds to suggest that multicollinearity is not problematic. In this case, all tolerance values are above 0.3, and all VIF values are below 3, indicating a low level of multicollinearity among the predictor variables.

The tolerance value for "Characterization of mHealth Users" is 0.788, and the corresponding VIF is 1.269. These values suggest that there is minimal collinearity between this variable and the other predictors. This implies that the influence of mHealth characterization on access to treatment can be independently assessed without significant distortion from other variables in the model. This finding underscores the importance of understanding how different aspects of mHealth utilization, such as user demographics and usage patterns, directly affect access to treatment.

"Knowledge Management" has a tolerance value of 0.367 and a VIF of 2.725, indicating a moderate level of collinearity. While this is higher than the other variables, it is still within acceptable limits. This suggests that knowledge management practices, which include the dissemination and use of health information, are crucial for improving access to treatment. Effective knowledge management can enhance teenagers' understanding of their health status and treatment protocols, thus supporting better health outcomes.

The tolerance value for "Technology Obsolescence" is 0.386, with a VIF of 2.590, indicating moderate collinearity. This highlights the importance of addressing technological obsolescence in mHealth interventions. Ensuring that the technology used is up-to-date and accessible can prevent barriers to treatment access. This is particularly important in resource-constrained settings where outdated technology may hinder effective communication and information dissemination.

For "Community Support," the tolerance value is 0.540, and the VIF is 1.851, suggesting low collinearity. This emphasizes the significant role that community support systems play in facilitating access to treatment. Strong community networks can provide emotional, social, and practical support, which is essential for teenagers managing HIV/AIDS. Community support can enhance treatment adherence and improve overall health outcomes by creating a supportive environment for individuals to seek and continue treatment.

Lastly, "Access to Treatment" has a tolerance value of 0.543 and a VIF of 1.842, indicating low collinearity. This reinforces the importance of ensuring that treatment access is not impeded by other factors. The low collinearity here suggests that the model can reliably predict how access to treatment is influenced by the other variables without significant overlap. In conclusion, the collinearity statistics indicate that the predictor variables in the model are sufficiently independent, allowing for a reliable analysis of their effects on access to treatment. Addressing each of these factors—mHealth user characterization, knowledge management, technology obsolescence, and community support—can lead to a comprehensive strategy for improving treatment access for teenagers living with HIV/AIDS in the Island Communities of Lake Victoria..

Table 4.5: Test for Multicollinearity

Model		Collinearity Statistics	
		Tolerance	**VIF**
1	Characterization of mHealth Users	0.788	1.269
	Knowledge management	0.367	2.725
	Technology Obsolescence	0.386	2.590
	Community Support	0.540	1.851
	Access to treatment	0.543	1.842

a. Dependent Variable: Access to Treatment

4.6.3 Test for Heteroscedasticity

Heteroscedasticity refers to non-constant variance while homoscedasticity refers to constant variance. A classical assumption in linear model estimation is that the residual term is homoscedastic. A statistical test of heteroscedasticity was carried out to confirm homoscedasticity with statistical significance. The Breusch-Pagan test was carried out where the BP Lagrange multiplier (LM) statistic was computed for the residuals. The BP and Koenker tests the hypothesis:

H_0: Residuals do not exhibit heteroscedasticity (residuals are homoscedastic).

The P-value of the BP-LM test as shown in Table 4.6 were greater than 0.05 implying that we fail to reject H_0 and therefore conclude that the residuals do not exhibit heteroscedasticity thus meeting the homoscedasticity assumption.

The results from the heteroscedasticity tests, specifically the Breusch-Pagan (BP) test and the Koenker test, indicate that there is no significant evidence of heteroscedasticity in the regression model. For the BP test, the LM statistic is 5.998 with a p-value of 0.320, which is greater than the conventional alpha level of 0.05. Consequently, we fail to reject the null hypothesis of homoscedasticity, suggesting that the variance of the errors is constant. Similarly, the Koenker test results show an LM statistic of 1.986 with a p-value of 0.654, which also leads us to fail to reject the null hypothesis of

homoscedasticity. These consistent findings from both tests confirm that the model does not suffer from heteroscedasticity issues.

The implications of these findings are significant for the study on the effect of mHealth utilization on access to treatment by teenagers living with HIV/AIDS in the Island Communities of Lake Victoria. Firstly, the absence of heteroscedasticity implies that the classical linear regression model assumptions are upheld. This ensures that the estimators of the regression coefficients are unbiased and efficient, which enhances the credibility of the study's results and the robustness of the conclusions drawn from the model.

Moreover, the reliability of the standard errors of the regression coefficients is maintained in the absence of heteroscedasticity. This means that the statistical tests used to determine the significance of the predictors, such as t-tests and F-tests, are valid. As a result, the p-values and confidence intervals reported for the coefficients can be trusted. This reliability allows for accurate inferences about the relationships between mHealth utilization and access to treatment, which is crucial for guiding effective decision-making and resource allocation by policymakers and stakeholders.

Furthermore, confirming homoscedasticity enhances the generalizability of the study's findings. The results can be more confidently applied to the broader population of teenagers living with HIV/AIDS in similar island communities. This robustness ensures that the conclusions drawn are applicable in similar contexts, providing a sound basis for designing and implementing mHealth interventions aimed at improving treatment access and health outcomes for this vulnerable population. Overall, the validation of homoscedasticity supports the study's credibility and its potential to inform future health policies and practices.

Table 4.6: Test for Heteroscedasticity

	LM	Sig	Conclusions
BP	5.998	0.320	Fail to reject H_0
Koenker	1.986	0.654	

4.6.4 Test for Autocorrelation

The Durbin-Watson statistic is a measure used to detect the presence of autocorrelation in the residuals of a regression model. In this case, the Durbin-Watson statistic value of 1.765 suggests a lack of significant autocorrelation in the residuals. When the Durbin-Watson statistic falls between the range of 1.5 to 2.5, it indicates that there is no substantial autocorrelation in the data. Therefore, the value of 1.765 observed in this study's regression model suggests that the assumption of no autocorrelation is likely met.

The absence of significant autocorrelation in the residuals is crucial for ensuring the validity of the regression model's results and the reliability of the estimated coefficients. When autocorrelation is present, it can lead to biased parameter estimates and inaccurate hypothesis testing results. However, with no evidence of autocorrelation in the residuals, the coefficients obtained from the regression model are more likely to be unbiased and efficient. This enhances the credibility of the study's findings and strengthens the validity of the conclusions drawn from the regression analysis.

Furthermore, the absence of autocorrelation allows for more accurate forecasting and prediction based on the regression model. Autocorrelation can distort the patterns observed in the data, making it challenging to make reliable predictions about future outcomes. However, with autocorrelation ruled out, the regression model's predictions can be more trustworthy, enabling policymakers and stakeholders to make informed decisions about interventions aimed at improving access to treatment for teenagers living with HIV/AIDS in Island Communities of Lake Victoria. Overall, the confirmation of no significant autocorrelation in the residuals supports the robustness of the regression

analysis and enhances the study's credibility in informing evidence-based policies and practices.

Table 4.7: Autocorrelation Statistics

Model	Durbin-Watson
1	1.765

a. Predictors: (Constant), Characterization of mHealth Users, Knowledge Management, Technology Obsolescence, Community Support
b. Dependent Variable: Access to treatment

4.6.5 Test for Linearity

The table presents the results of the Test for Linearity ANOVA Statistics, which assesses whether there is a linear relationship between the predictors (Characterization of mHealth Users, Knowledge Management, Technology Obsolescence, and Community Support) and the dependent variable (Y). The ANOVA test evaluates whether the regression model fits the data significantly better than a model with no predictors (i.e., a constant-only model). The significant F-statistic of 4.895 with a corresponding p-value of 0.003 (significant at the 0.05 level) suggests that there is evidence to reject the null hypothesis of no linear relationship between the predictors and the dependent variable. This indicates that the regression model, which includes the predictors Characterization of mHealth Users, Knowledge Management, Technology Obsolescence, and Community Support, fits the data significantly better than a model with no predictors.

Implications of these findings include the confirmation that there exists a linear relationship between the predictors and the outcome variable (Y), implying that changes in the predictors are associated with a proportional change in the outcome variable. This underscores the importance of considering these factors collectively when assessing access to treatment for teenagers living with HIV/AIDS in Island Communities of Lake Victoria. Healthcare interventions targeting this population should focus on improving mHealth utilization, knowledge management, addressing technological obsolescence,

and strengthening community support, as these factors play significant roles in influencing access to treatment and healthcare outcomes.

Table 4.8: Test for Linearity ANOVA Statistics

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	44.698	4	11.174	4.895	.003[b]
	Residual	318.382	133	2.393		
	Total	363.080	137			

a. Dependent Variable: Y

b. Predictors: (Constant), Characterization of mHealth Users, Knowledge Management, Technology Obsolescence, Community Support

4.7 Characterization of mHealth Users

4.7.1 Descriptive Analysis for Characterization of mHealth Users

The findings reveal that a significant portion of teenagers living with HIV/AIDS in the studied population do not own mobile phones, with only 20.3% having access to one. Among those without personal devices, a substantial 44.9% rely on their parents to access mobile phones, indicating a dependence on familial support for connectivity. Additionally, the collective reliance on siblings and healthcare workers for access, at 5.1%, suggests alternative channels utilized by teenagers to overcome the barrier of not owning a mobile phone. However, the data also highlight a limitation in access to smartphones, with only 39.1% of the phones accessed by teenagers being smartphones, which are crucial for accessing advanced mHealth services.

These findings underscore the importance of addressing the digital divide among teenagers living with HIV/AIDS, particularly in terms of mobile phone ownership and access to smartphones. Limited access to smartphones may hinder these teenagers' ability to fully utilize mHealth services, which often require advanced features such as internet access and app functionality. As such, interventions aimed at improving access to healthcare services through mobile technology should prioritize initiatives to increase smartphone ownership among this population. Strategies could include providing

subsidies for smartphones, offering digital literacy training programs, and implementing initiatives to increase affordability and accessibility of mobile devices. By addressing these barriers, healthcare providers and policymakers can enhance the effectiveness of mHealth interventions and improve health outcomes for teenagers living with HIV/AIDS in Island Communities of Lake Victoria.

The data reveal that the frequency of access to mobile phones among teenagers living with HIV/AIDS varies, with a significant portion indicating occasional access, particularly when the mobile phone owner is around them (46.4%), and once or twice a day, typically in the morning or evening (31.1%). This suggests that while access to mobile phones is not constant for all teenagers, a considerable proportion still have regular opportunities to engage with mobile technology. However, concerning access to HIV information on mobile phones, a noteworthy finding emerges: the majority of teenagers (63.8%) accessed this information with a caregiver. This highlights the role of caregivers in facilitating access to crucial health information among teenagers living with HIV/AIDS, indicating a potential avenue for targeted interventions and support mechanisms.

These findings underscore the importance of understanding the dynamics of access to mobile phones and HIV-related information among teenagers in Island Communities of Lake Victoria. While the data suggest that caregivers play a significant role in facilitating access to health information, there is a need to ensure that teenagers have independent access to accurate and reliable HIV-related information on their mobile phones. Interventions aimed at promoting health literacy and empowering teenagers to access and evaluate information independently can enhance their ability to manage their HIV/AIDS condition effectively. Additionally, initiatives to provide caregivers with resources and training on supporting teenagers in accessing and understanding health information on mobile phones can further strengthen the effectiveness of mHealth interventions in this context. By addressing these challenges and leveraging the role of caregivers, healthcare providers and policymakers can promote better health outcomes for teenagers living with HIV/AIDS in Island Communities of Lake Victoria.

The findings reveal that the majority of airtime for mobile phones used by teenagers living with HIV/AIDS is purchased by individuals whom the teenagers consider as parents, including fathers, mothers, uncles, aunts, and elder cousins, accounting for 65.2% of the total. This highlights the significant role of familial support in ensuring access to communication resources among teenagers in Island Communities of Lake Victoria. Additionally, it suggests that parents and other family members are actively involved in facilitating teenagers' access to mobile phone services, which can be crucial for accessing healthcare information and support. However, it's notable that Civil Society Organizations (NGOs and FBOs) contribute a relatively small percentage (1.4%) to the purchase of airtime, indicating a potential gap in external support for communication needs among teenagers in this context.

Moreover, the data indicate that when it comes to purchasing internet bundles, Civil Society Organizations (NGOs and FBOs) play a more significant role, contributing 57.2% of the total. This suggests that while familial support may primarily cover basic communication needs such as airtime, external organizations are instrumental in providing access to more advanced services like internet connectivity. The reliance on NGOs and FBOs for internet bundles underscores the importance of external support in facilitating access to online resources and information, including HIV-related content. However, it also raises questions about the sustainability and continuity of such support, particularly considering the fluctuating nature of funding for civil society initiatives. Overall, these findings emphasize the need for a multi-faceted approach to supporting teenagers' access to communication resources and HIV information, involving both familial and external support networks to ensure comprehensive coverage and sustainability.

The data reveal that the majority of teenagers spend between 6 to 15 minutes accessing HIV information via mobile phones, comprising 49.2% of the respondents. This suggests that teenagers are dedicating a considerable amount of time to engage with HIV-related content, indicating a significant interest and motivation in seeking information about their health condition. Spending this amount of time may allow

teenagers to explore various resources, access comprehensive information, and engage in educational materials or support networks available through mHealth platforms. However, it's notable that a significant portion, 24.7%, spend a maximum of five minutes or less accessing HIV information. This could indicate either a lack of sustained interest or limited access to resources, potentially due to factors such as time constraints, limited data or internet connectivity, or competing priorities.

Furthermore, the data indicate that a smaller percentage of teenagers, 21.8%, spend between 16 to 25 minutes accessing HIV information, while only a very small fraction, 4.3%, spend more than 26 minutes. This distribution suggests varying levels of engagement and interest among teenagers in accessing HIV-related content. While the majority spend a moderate amount of time, there are subsets of individuals who either dedicate more time to explore in-depth information or have limited engagement with available resources. Understanding these patterns of usage is crucial for designing tailored interventions and optimizing mHealth platforms to effectively meet the diverse needs and preferences of teenagers living with HIV/AIDS. Additionally, it underscores the importance of providing easily accessible, concise, and engaging content that can accommodate different levels of interest and time availability among teenagers in accessing vital HIV information.

A key informant who overseas health programs in the County under the Anglican Development Services (ADS) Project, has engaged young people on matters of SRHR through mHealth in Mfangano, Takawiri, Ringiti and Remba Islands. He alludes to the availability of mHealth activities through a trio-approach of the ADS services in the islands: FaceBook (Youth4srhr), WhatsApp (Youth4srhrmfangano) and the SMS Platform (initially 20141 and now 20394). One of the factors why the Civil Society Organizations leads in bundle purchase (at 57.2%) as indicated in Table 4.9 below.

Table 4.9: Mobile Phone Ownership and Access by Teenagers Living with HIV/AIDS on mHealth

Characteristic	Case	
	n = 138	%
Mobile phone ownership		
Yes	28	20.3
No	110	79.7
Ways of accessing a mobile phone		
Friends	11	8.0
Siblings	3	2.2
Healthcare worker	4	2.9
Parents	62	44.9
Caregiver (non-parental)	30	21.7
Personal phone	28	20.3
Mobile phone access		
Smartphone	54	39.1
Non-smartphone	84	60.9
Frequency of mobile phone access		
Once a day	26	18.8
Twice a day	17	12.3
Three time a day	10	7.2
Occasionally	64	46.4
Always	21	15.2
Access to HIV information on mobile phone		
Alone	41	29.7
With a friend	5	3.6
In a group	4	2.9
With caregiver	88	63.8
Airtime purchase		
Self (the teenager)	26	18.8
Friend (the teenager's friends)	6	4.3
Healthcare worker (those are the health facility)	14	10.1
Parent (also guardian)	90	65.2
CSO (NGO, FBO)	2	1.4
Bundles purchase		
Self (the teenager)	37	26.8
Friend (the teenagers' friends)	6	4.3
Healthcare worker (those are the health facility)	6	4.3
Parent	10	7.2
CSO (NGO, FBO)	79	57.2
Minutes spent accessing HIV information		
≤ 5	34	24.7
6 to 15	68	49.2
16 to 25	30	21.8
≥ 26	6	4.3

The findings reveal that the primary focus of teenagers living with HIV/AIDS when searching for information on mHealth platforms is to understand test results and treatment options. This shared priority is reflected in the substantial percentage of both the case and control groups, with 52.2% and 55.5% respectively, indicating a strong demand for information related to their diagnosis and available treatment modalities. This underscores the critical role of mHealth platforms in providing accessible and relevant information that empowers teenagers to manage their health condition effectively. However, it's noteworthy that there was no indication from any respondent of seeking information on how to conduct disclosure to family, friends, or sexual partners. This absence suggests a potential gap in the information available through mHealth platforms, as disclosure is an essential aspect of HIV management and can significantly impact treatment adherence, social support, and overall well-being.

The implications of these findings are multifaceted. Firstly, they highlight the importance of tailoring mHealth interventions to address the specific informational needs and preferences of teenagers living with HIV/AIDS. Providing comprehensive and user-friendly resources on understanding test results, treatment options, and other pertinent aspects of HIV management can enhance self-efficacy, treatment adherence, and overall health outcomes among this population. Secondly, the absence of information-seeking behavior related to disclosure underscores the need for greater attention to psychosocial support and guidance on navigating sensitive issues surrounding HIV status disclosure. Integrating resources and tools that facilitate safe and supportive disclosure conversations within mHealth platforms could fill this gap and contribute to improved communication and relationships within teenagers' social networks. Overall, these findings emphasize the importance of continuously evaluating and refining mHealth interventions to ensure they address the evolving needs and priorities of teenagers living with HIV/AIDS.

The findings indicate that among the control group, non-mHealth HIV-related information resource points predominantly include health facilities and parents/guardians. This suggests that traditional healthcare settings and familial support

networks remain primary sources of information and guidance for adolescents not utilizing mHealth platforms. However, it's notable that teachers were the least cited as information points, underscoring a potential gap in leveraging educational settings for HIV-related information dissemination and support. Moreover, the key informant's insights into the DREAMS project, supported by USAID, shed light on innovative approaches to leveraging mHealth for improving adherence among adolescent girls living with HIV/AIDS. The project's use of mobile applications to provide reminders for medication adherence and clinic visits, alongside incentives such as monetary rewards and psychosocial support, demonstrates the potential of mHealth interventions to enhance treatment outcomes and support adolescents in managing their HIV/AIDS condition effectively.

The implications of these findings are significant for both healthcare providers and policymakers. Firstly, they underscore the importance of integrating mHealth interventions into existing healthcare systems to complement traditional information resource points and enhance accessibility to HIV-related support services, especially among adolescents. Additionally, the success of the DREAMS project highlights the effectiveness of combining technological innovations with psychosocial support mechanisms to address the multifaceted needs of adolescents living with HIV/AIDS. This underscores the importance of adopting holistic approaches to mHealth intervention design, incorporating elements of motivation, support, and empowerment to promote sustained engagement and positive health behaviors among adolescents. Moving forward, healthcare providers and policymakers should prioritize the scalability and sustainability of such mHealth initiatives to maximize their impact and reach among vulnerable populations, ultimately contributing to improved HIV/AIDS management and outcomes.

Regarding the sites that the teenagers used to seek for HIV related information, the majority, at 79.7% used social media (that is, Facebook, WhatsApp, YouTube, Instagram, Google, LinkedIn, Telegram, Twitter), while 5.8% used NGO specific sites to seek for such information. As shown in Table 4.10 below, the rest, at 14.5% used

Text-based (SMS) to solicit for such information. The findings reveal that social media platforms are the primary sources for teenagers seeking HIV-related information, with a significant majority utilizing platforms such as Facebook, WhatsApp, YouTube, and others. This underscores the importance of leveraging social media as a key channel for disseminating HIV/AIDS information and engaging with adolescents, given its widespread popularity and accessibility among this demographic. Social media offers a dynamic and interactive space where adolescents can access a wide range of information, engage in discussions, and connect with peers, influencers, and organizations involved in HIV/AIDS awareness and support initiatives. However, it's crucial to ensure the accuracy and reliability of information shared on these platforms, as misinformation and myths about HIV/AIDS may also proliferate.

Additionally, the relatively low usage of NGO-specific sites and text-based (SMS) platforms highlights potential areas for improvement in reaching adolescents with HIV-related information. While social media platforms offer broad reach and interactivity, targeted efforts through specialized NGO websites and SMS-based communication channels can provide more focused and tailored support to adolescents living with HIV/AIDS. Strengthening partnerships between NGOs, healthcare providers, and telecommunications companies to develop and promote HIV/AIDS information services through these channels could enhance accessibility and engagement among adolescents, particularly those who may have limited access to social media or prefer more direct and personalized forms of communication. Overall, these findings emphasize the importance of adopting a multi-faceted and integrated approach to HIV/AIDS information dissemination, leveraging a diverse range of communication channels to effectively reach and engage adolescents living with HIV/AIDS.

The statistics reveal the preferences of teenagers living with HIV/AIDS in seeking specific types of information related to HIV. The majority of both case and control groups showed interest in treatment options, with 31.9% of the case group and 31.1% of the control group searching for information in this category. Understanding test results was also a significant area of interest, with 20.3% of the case group and 24.4% of the

control group seeking information on types of lab tests, CD4 count, viral load, and drug resistance. However, notably, no respondents in either group searched for information specifically related to the disclosure of HIV status, suggesting a potential gap in awareness or a lack of perceived need for such information among teenagers living with HIV/AIDS.

This highlights the critical importance of providing comprehensive and accessible information on treatment options to adolescents living with HIV/AIDS, as it directly impacts their management of the condition and overall well-being. Ensuring that teenagers have access to accurate and up-to-date information about their treatment options can empower them to make informed decisions about their healthcare and enhance their medication adherence, which is crucial for achieving positive health outcomes and reducing the risk of drug resistance.

Moreover, the relatively lower interest in topics such as risk reduction, HIV testing, and immune system functioning underscores the need for targeted education and awareness campaigns to address gaps in knowledge and understanding among adolescents living with HIV/AIDS. Efforts should be made to increase awareness about the importance of regular HIV testing, risk reduction strategies, and the functioning of the immune system in managing HIV/AIDS. Additionally, the absence of interest in topics related to disclosure of HIV status highlights potential challenges or barriers that adolescents may face in disclosing their HIV status to others, including family members, friends, and sexual partners. This underscores the importance of providing support and guidance to adolescents on how to navigate disclosure decisions and address associated stigma and discrimination. Overall, these findings emphasize the importance of tailoring HIV/AIDS education and support services to the specific needs and preferences of adolescents, ensuring that they have access to comprehensive information and resources to effectively manage their condition and lead healthy lives.

Table 4.10: HIV/AIDS Information Searched by Teenager

Characteristic	Case		Control	
	n = 138	%	n = 45	%
Sites Searched for HIV related information				
Social media	110	79.7	-	-
CSO-based (NGO, FBO)	8	5.8	-	-
SMS (Text-based)	20	14.5	-	-
HIV related information Searched for				
Risk reduction (Reducing sexual exposures, pre-exposure prophylaxis, blood transfusion, drugs and substance abuse)	22	15.9	7	15.6
HIV testing (HIV test locations, HIV testing frequency, Confidential and Anonymous)	17	12.3	6	13.3
Immune system (HIV Lifecycle, Stages of HIV Infection, Physical Changes)	27	19.6	7	15.6
Understanding test results (Types of Lab Tests, CD4 Count, Viral Load, Drug resistance)	28	20.3	11	24.4
Treatment options (Reasons to Start Treatment, Side Effects, Medication Adherence, Drug Resistance)	44	31.9	14	31.1
Disclosure of HIV status	0	0.0	0	0.0
Non-mHealth HIV related information resource points				
Health facility	-	-	20	44.4
Parents/Guardians	-	-	11	24.4
Friends	-	-	7	15.6
Siblings	-	-	6	13.3
Teachers	-	-	1	2.2

4.7.2 Inferential Analysis for Characterization of mHealth Users

Correlation Analysis

The correlation coefficient is a measure of linear association between two variables. Values of the correlation coefficient are always between -1 and +1. A correlation coefficient of +1 indicates that two variables are perfectly related in a positive linear sense, a correlation coefficient of -1 indicates that two variables are perfectly related in a negative linear sense, and a correlation coefficient of 0 indicates that there is no linear relationship between the two variables. A correlation coefficient of between 0.0 and 0.19 is considered to be “very weak”, between 0.20 and 0.39 is considered to be “weak”,

between 0.40 and 0.59 is considered to be “moderate”, between 0.60 and 0.79 is considered to be “strong” and between 0.80 and 1.0 is considered to be “very strong”. The study conducted a correlation analysis between the variables of the study using Pearson product-moment correlation coefficient. Pearson Product moment correlation was used to determine the relationship between independent variable (Characterization of mHealth users) and dependent variable (access to treatment by teenagers living with the HIV).

The correlation analysis between the characterization of mHealth users and access to treatment among teenagers living with HIV/AIDS in island communities of Lake Victoria reveals a significant positive correlation ($R = 0.318$, $p < 0.001$). This indicates that there is a moderate positive relationship between the characterization of mHealth users and access to treatment. In other words, as the characterization of mHealth users increases, there is a tendency for access to treatment among teenagers living with HIV/AIDS to also increase. This suggests that factors related to how teenagers utilize mHealth resources are associated with their ability to access treatment for HIV/AIDS.

The findings imply that understanding the characteristics and behaviors of teenagers in utilizing mHealth services can provide insights into their access to treatment. It suggests that interventions aimed at improving access to treatment for teenagers living with HIV/AIDS could benefit from a focus on enhancing mHealth utilization and addressing any barriers or challenges related to the use of mobile health technologies. Additionally, this correlation underscores the potential of mHealth platforms to serve as effective tools for facilitating access to HIV/AIDS treatment among teenagers in island communities of Lake Victoria. Therefore, efforts to promote the effective utilization of mHealth resources tailored to the needs of this population could contribute to improving their overall health outcomes.

Table 4.11: Correlation Analysis of Characterization of mHealth Users

		Access to Treatment
Access to Treatment	R	1.000
	Sig. (2-tailed)	.
	N	
Characterization of mHealth Users	R	.318
	Sig. (2-tailed)	.000
	N	138

The significant positive correlation between the characterization of mHealth users and access to treatment ($R = .318$, $p < .001$) in the context of teenagers living with HIV/AIDS in island communities of Lake Victoria corroborates with previous research highlighting the importance of mobile health technologies in improving healthcare access (Mugenda & Mugenda, 2012). Previous studies have emphasized the role of mHealth in bridging gaps in healthcare delivery, including facilitating access to HIV/AIDS treatment and support services (Lee et al., 2018). For example, research has shown that mobile phone-based interventions can enhance adherence to antiretroviral therapy (ART) among adolescents and young adults living with HIV/AIDS, ultimately improving treatment outcomes and overall health status (Radovic et al., 2017). Additionally, studies have demonstrated the effectiveness of mHealth in overcoming barriers to healthcare access, such as transportation challenges and limited availability of healthcare providers in remote areas (Awiti et al., 2016).

By corroborating with previous findings, the observed positive correlation underscores the growing recognition of mHealth as a valuable tool for expanding access to HIV/AIDS treatment and care (Deloitte, 2012). It suggests that efforts to promote mHealth utilization among teenagers living with HIV/AIDS in island communities of Lake Victoria are in line with established evidence-based strategies for improving health outcomes in this population (Hampshire et al., 2015). Furthermore, it highlights the importance of continued research and investment in innovative mobile health solutions tailored to the unique needs and contexts of adolescents and young people affected by HIV/AIDS (Chang et al., 2013).

The positive correlation between the characterization of mHealth users and access to treatment among teenagers living with HIV/AIDS in island communities of Lake Victoria resonates with previous research emphasizing the role of mHealth in improving healthcare access and outcomes. Studies such as those conducted by Free et al. (2013) and Hall et al. (2014) have highlighted the potential of mHealth interventions to enhance access to healthcare services, particularly in underserved or remote areas. These studies have demonstrated that factors such as user engagement, digital literacy, and the usability of mHealth platforms play crucial roles in determining their effectiveness in facilitating access to treatment.

Furthermore, research by Lee et al. (2016) and Mechael et al. (2010) has emphasized the importance of user-centered approaches in mHealth interventions. By understanding the unique needs, preferences, and behaviors of target populations, healthcare providers can design mHealth solutions that are tailored to their specific context and requirements. This approach aligns with the findings of the current study, which suggest that interventions aimed at improving access to treatment can benefit from a focus on enhancing the characterization of mHealth users.

Moreover, the significant positive correlation underscores the potential of mHealth platforms to bridge gaps in healthcare access, particularly for vulnerable populations such as teenagers living with HIV/AIDS in island communities. Research by Gurman et al. (2015) and Feroz et al. (2017) has highlighted the importance of health literacy and education in maximizing the impact of mHealth interventions. These studies have shown that interventions that empower users with knowledge and skills to effectively utilize mHealth resources can lead to improved health outcomes.

Overall, the correlation findings of this study reinforce existing evidence on the positive relationship between mHealth utilization and healthcare access. By understanding and addressing factors related to the characterization of mHealth users, policymakers and healthcare providers can optimize the design and implementation of mHealth interventions to better meet the needs of teenagers living with HIV/AIDS in island

communities. Additionally, future research should continue to explore the dynamic interplay between mHealth utilization, user characteristics, and healthcare access to inform the development of targeted interventions and policies.

Regression Analysis

Regression analysis is a form of predictive modeling technique which investigates the relationship between a dependent and independent variable(s). This study applied a regression model to identify the effect of characterization of mHealth Users and their impact on access to treatment by teenagers living with HIV. Regression analysis was conducted to determine the proportion of access to treatment (dependent variable) which could be predicted by characterization of mHealth users (independent variable). It was hypothesized that:

H_{a1}: There is significant relationship between characterization of mHealth users and treatment access by teenagers living with HIV from island communities of Lake Victoria

To test this hypothesis, the model $Y= \beta_0 + \beta_1 X_1 + \varepsilon$ was fitted. Where y is treatment access by teenagers living with HIV from island communities of Lake Victoria X_1 is characterization of mHealth users.

The model summary in Table 4.12 provides several key statistics that help understand the relationship between the characterization of mHealth users and access to treatment among teenagers living with HIV/AIDS in the island communities of Lake Victoria.

R (Correlation Coefficient): The value of R=0.318 indicates a moderate positive correlation between the characterization of mHealth users and access to treatment. This implies that as the characterization of mHealth users improves, access to treatment also tends to improve. R Square (Coefficient of Determination): The R^2=0.101 value indicates that approximately 10.1% of the variance in access to treatment can be explained by the characterization of mHealth users. While this is a modest proportion, it suggests that other factors also play significant roles in influencing access to treatment.

Adjusted R Square: The adjusted R^2 =0.053 accounts for the number of predictors in the model and the sample size, providing a more accurate measure of the model's explanatory power. It indicates that about 5.3% of the variability in access to treatment is explained by the model after adjusting for the number of predictors. Standard Error of the Estimate: The standard error of 0.488 indicates the average distance that the observed values fall from the regression line. A lower standard error suggests that the model more accurately predicts access to treatment.

The findings suggest that the characterization of mHealth users has a statistically significant but modest impact on access to treatment for teenagers living with HIV/AIDS in the island communities of Lake Victoria. This moderate correlation (R = 0.318) underscores the importance of mHealth in enhancing treatment accessibility but also highlights that mHealth alone cannot fully address the complexities of healthcare access. The modest R^2 value implies that while mHealth is an important tool, there are other significant factors influencing access to treatment. These could include socio-economic conditions, healthcare infrastructure, cultural attitudes towards HIV/AIDS, and education levels. Therefore, interventions aimed at improving access to treatment should adopt a multifaceted approach that includes but is not limited to mHealth solutions.

Furthermore, the findings align with existing literature emphasizing the potential of mHealth to improve health outcomes, particularly in resource-limited settings (Lee et al., 2018; Radovic et al., 2017). They suggest that investments in mHealth technologies and strategies tailored to the specific needs of these communities can yield positive outcomes, but should be part of broader, integrated healthcare strategies. In conclusion, while mHealth characterization is a valuable predictor of access to treatment, enhancing its effectiveness will require addressing other barriers and leveraging a comprehensive healthcare approach (Deloitte, 2012; Hampshire et al., 2015). Continued research and targeted interventions are necessary to maximize the potential benefits of mHealth for teenagers living with HIV/AIDS in these island communities.

Table 4.12: Model Summary (Characterization of mHealth Users and Access to Treatment)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.318[a]	.101	.053	.488

a. Predictors: (Constant), Characterization of mHealth users

The ANOVA statistics provided in Table 4.13 offer valuable insights into the relationship between the characterization of mHealth users and access to treatment among teenagers living with HIV/AIDS in the island communities of Lake Victoria. The regression model, which includes the characterization of mHealth users as the predictor variable, significantly explains the variation in access to treatment. The regression sum of squares is 3.489, indicating the amount of variation in access to treatment that the model accounts for. In contrast, the residual sum of squares is 31.011, representing the unexplained variation. The total sum of squares, combining both explained and unexplained variations, is 34.500.

The degrees of freedom for the regression model is 1, reflecting the single predictor variable, while the residual degrees of freedom is 136. The mean squares, obtained by dividing the sum of squares by the respective degrees of freedom, are 3.489 for the regression and 0.228 for the residual. The F-statistic of 14.688, coupled with a significance level (p-value) of 0.000, indicates that the model is statistically significant. This means that the characterization of mHealth users is a meaningful predictor of access to treatment, as the p-value is well below the conventional threshold of 0.05.

The significant results from the ANOVA analysis have several important implications. Firstly, the characterization of mHealth users emerges as a significant predictor of access to treatment. This finding suggests that enhancing how mHealth is utilized and understood can positively influence treatment accessibility for teenagers living with HIV/AIDS in the island communities of Lake Victoria. It underscores the potential of mHealth initiatives to improve health outcomes in remote and underserved areas. Secondly, the results highlight the need for policymakers and healthcare providers to

focus on mHealth services. Given their significant impact, investments should be directed towards tailoring these services to meet the specific needs of teenagers in these communities. This includes ensuring that mHealth applications are user-friendly and culturally appropriate, and that they effectively address the barriers faced by these teenagers.

Additionally, while the characterization of mHealth users is important, the relatively low R^2 value of 10.1% from the model summary indicates that other factors also play crucial roles in access to treatment. This suggests that a holistic approach, integrating mHealth with other healthcare interventions, is essential. Comprehensive strategies should include community health programs, education, and economic support to create a more robust healthcare system for these teenagers. Finally, the significant findings from this study point to the need for further research to identify other variables that influence access to treatment. Understanding the broader context and additional factors that affect healthcare access can lead to more effective and comprehensive solutions. This ongoing research is crucial for developing strategies that can significantly improve treatment outcomes for teenagers living with HIV/AIDS in remote and underserved communities.

Table 4.13: ANOVA Statistics (Characterization of mHealth Users and Treatment Access.)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.489	1	3.489	14.688	.000[b]
	Residual	31.011	136	.228		
	Total	34.500	137			

A. Dependent Variable: Care
b. Predictors: (Constant), characterization of mHealth users

The regression coefficients presented in Table 4.14 provide detailed insights into the relationship between the characterization of mHealth users and treatment access among teenagers living with HIV in the island communities of Lake Victoria. The intercept (B=4.876) represents the expected value of the dependent variable (treatment access) when the predictor (characterization of mHealth users) is zero. This suggests that, in the

absence of the effect of mHealth user characterization, the baseline level of treatment access is 4.876.

The unstandardized coefficient for the characterization of mHealth users is B=0.388. This indicates that for each one-unit increase in the characterization of mHealth users, the treatment access score increases by 0.388 units, holding all other factors constant. The standardized coefficient (Beta) of 0.367 shows the relative importance of the predictor variable, where a higher Beta value indicates a stronger relationship between the predictor and the dependent variable. The t-value of 9.023 and the significance level (p-value) of 0.000 demonstrate that the predictor is highly statistically significant. This means there is strong evidence that characterization of mHealth users positively influences treatment access.

Based on the unstandardized coefficients, the regression equation can be formulated as: Treatment Access= 4.876+0.388×Characterization of mHealth Users

The significant positive coefficient for the characterization of mHealth users suggests that improving how mHealth is characterized and utilized has a direct positive impact on treatment access for teenagers living with HIV. This implies that initiatives aimed at enhancing mHealth literacy and usability can lead to better health outcomes. Policymakers and healthcare providers should prioritize enhancing mHealth platforms and training programs. By focusing on improving the characterization and understanding of mHealth tools, they can significantly boost treatment access and adherence among this vulnerable population.

The relatively high intercept value (4.876) indicates that even without considering mHealth characterization, there is a notable level of treatment access. This could be attributed to existing healthcare services and interventions in place. However, there is clear potential for further improvement through targeted mHealth strategies. While mHealth characterization is important, the equation suggests that other factors also influence treatment access. A comprehensive approach that integrates mHealth with

other support systems such as community health workers, educational programs, and social support networks is essential for maximizing treatment access and adherence.

The strong significance of the characterization of mHealth users highlights its critical role, but further research is necessary to identify additional factors that affect treatment access. Understanding these factors will help in designing holistic interventions that address all barriers to healthcare access for teenagers living with HIV in these communities. Overall, the findings underscore the importance of mHealth in enhancing treatment access and suggest that targeted efforts to improve mHealth services could have substantial benefits for teenagers living with HIV in the island communities of Lake Victoria.

Table 4.14: Regression Coefficients (Characterization of mHealth Users and Treatment Access

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	**Std. Error**	**Beta**	**T**	**Sig.**
1	(Constant)	4.876	.710		6.867	.000
	Characterization of mHealth Users	.388	.043	.367	9.023	.000

a. Dependent Variable: Treatment access by teenagers living with HIV from island communities of Lake Victoria.

The significant positive relationship between the characterization of mHealth users and treatment access observed in this study aligns with previous research emphasizing the role of mobile health technologies in improving healthcare access and outcomes. Studies by Lee et al. (2016) and Mechael et al. (2010) have highlighted the potential of mHealth interventions to overcome barriers to healthcare access, particularly in resource-constrained settings. These studies have demonstrated that effective utilization of mHealth tools, coupled with appropriate user characterization and education, can enhance patient engagement, promote treatment adherence, and ultimately improve health outcomes.

Furthermore, research by Gurman et al. (2015) and Hamine et al. (2015) has emphasized the importance of user-centered design principles in mHealth interventions. By tailoring mHealth platforms to the specific needs and preferences of target populations, healthcare providers can enhance usability and promote engagement among users. This approach aligns with the findings of the current study, which suggest that improving the characterization of mHealth users positively influences treatment access among teenagers living with HIV in island communities.

Moreover, the significant positive coefficient for the characterization of mHealth users corroborates with studies emphasizing the importance of health literacy and digital literacy in mHealth utilization. Research by Free et al. (2013) and Feroz et al. (2017) has highlighted the role of health education and awareness campaigns in promoting the effective use of mHealth technologies. These studies have shown that improving users' understanding of mHealth tools and their benefits can lead to increased uptake and utilization of these technologies, ultimately improving healthcare access and outcomes.

Overall, the findings of this study reinforce existing evidence on the positive impact of mHealth on treatment access and adherence. By focusing on improving the characterization of mHealth users and enhancing usability, policymakers and healthcare providers can leverage mHealth technologies to bridge gaps in healthcare access and deliver more patient-centered care. Additionally, future research should continue to explore the multifaceted factors influencing treatment access among teenagers living with HIV/AIDS, including the interplay between mHealth utilization, health literacy, and socio-economic determinants.

4.8 Knowledge Management

4.8.1 Descriptive Analysis for Knowledge Management

The data on the formats most frequently used for mHealth access among teenagers living with HIV in the island communities of Lake Victoria reveals that the majority (52.9%)

of teenagers prefer text-based formats. This is followed by audio formats at 19.6%, video formats at 16.7%, and pictorial formats at 10.9%. These preferences provide insight into how teenagers engage with mHealth tools and what types of content delivery are most effective for this demographic. The preference for text-based formats suggests that written information is the most accessible and perhaps the most convenient form of communication for teenagers in these communities. This could be due to the familiarity with text messaging and the availability of basic mobile phones that support text communication. The prominence of text formats implies that mHealth interventions should prioritize clear, concise, and informative text content to effectively reach this audience. This might include SMS reminders for medication adherence, text-based health tips, and informational messages about HIV treatment and prevention.

The significant use of audio formats (19.6%) and video formats (16.7%) indicates that there is also a demand for more dynamic and engaging content. Audio formats can be particularly beneficial for those with literacy challenges or for conveying information in a more personal and relatable manner. Video content, which combines visual and auditory elements, can enhance understanding and retention of information. Given these findings, mHealth programs should incorporate multimedia content to cater to diverse preferences and learning styles. For example, short videos demonstrating how to take medications or audio messages providing encouragement and support could be highly effective.

The lower usage of pictorial formats (10.9%) suggests that while visual aids are useful, they are not the primary method of accessing information. This might be due to limitations in the availability of smartphones or internet connectivity required to download and view images. Nonetheless, pictorial content can be valuable for simplifying complex information and should still be integrated into mHealth strategies, especially in combination with text and audio. Overall, the data underscores the need for a multi-faceted approach in mHealth interventions. Programs should leverage the predominant text format while also expanding the use of audio and video content to engage a wider audience. By tailoring mHealth services to the preferences and needs of

teenagers living with HIV, healthcare providers can enhance the effectiveness of their interventions, improve health literacy, and ultimately, promote better health outcomes in the island communities of Lake Victoria.

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The data on the preferred formats for receiving mHealth information indicates that a significant majority of teenagers prefer video format, with 43.5% expressing this preference. This is followed by text format at 29.0%, audio format at 21.7%, and pictorial format at 5.8%. These preferences reveal important insights into how teenagers in the island communities of Lake Victoria engage with mHealth information and the potential effectiveness of different communication mediums. The clear preference for video format (43.5%) among teenagers suggests that mHealth interventions should prioritize video content to maximize engagement and information retention. Videos are likely preferred because they combine visual and auditory elements, making them more engaging and easier to understand, particularly for complex health information such as HIV treatment and prevention. The preference for text format (29.0%) indicates that a substantial portion of teenagers still value the clarity and directness that written information can provide. This suggests that mHealth programs should also include textual information, which can be useful for detailed explanations and reference purposes.

The significant number of teenagers who prefer audio format (21.7%) highlights the importance of incorporating audio content into mHealth strategies. Audio can be particularly useful for teenagers who may have limited literacy skills or who prefer to receive information while multitasking or on the go. The low preference for pictorial format (5.8%) suggests that while visuals are important, they are not as impactful on

their own compared to formats that combine multiple sensory inputs.The primary reasons for preferring certain formats provide further insights. The top reason, "Attracts attention" (48.6%), underscores the need for engaging and captivating content to hold the interest of teenagers. This suggests that mHealth interventions should focus on creating visually and audibly appealing materials that capture and maintain the attention of this age group. The reason "Demonstrates steps of doing something" (23.9%) highlights the value of instructional content that guides teenagers through specific actions, such as how to take medication correctly or how to use HIV prevention tools. This implies that video and audio content should include clear, step-by-step instructions to enhance practical understanding and adherence to health practices. "Provides basic information on HIV health services" (15.9%) indicates that teenagers are looking for straightforward, informative content about the services available to them. This reinforces the need for comprehensive educational materials that cover the basics of HIV health services, available both in video and text formats. The reason "I can engage with source of information" (7.2%) suggests that interactive elements in mHealth content are valued, though to a lesser extent. This indicates that while interactivity is beneficial, it should complement rather than replace the core content formats.

The least cited reason, "Can be distributed in various ways" (4.3%), suggests that the distribution method is less of a concern for teenagers compared to the content itself. This implies that the focus should be on the quality and format of the information provided, ensuring it is engaging and informative, regardless of the distribution channel. Overall, the preference for video and text formats, along with the need for attention-grabbing and instructional content, indicates that mHealth programs targeting teenagers in the island communities of Lake Victoria should leverage multimedia approaches. Videos should be central to these strategies, supported by text and audio formats, to ensure comprehensive and effective dissemination of HIV-related information. By aligning content delivery with these preferences, mHealth interventions can better meet the informational and engagement needs of teenagers living with HIV/AIDS in these communities.

Table 4.15: Mostly Used and Preferred Format to Receive mHealth

Category	Case	
	n = 138	%
Format mostly used for mHealth access		
Text	73	52.9
Pictorial	15	10.9
Audio	27	19.6
Video	23	16.7
Preferred format to receive mHealth		
Text	40	29.0
Pictorial	8	5.8
Audio	30	21.7
Video	60	43.5
Reason for preferred format (Text, Audio & Video) to receive mHealth		
Attracts attention.	67	48.6
Can be distributed in various ways.	6	4.3
Provides basic information on HIV health services.	22	15.9
Demonstrates steps of doing something.	33	23.9
I can engage with source of information.	10	7.2

The data in Table 4.16 shows the distribution of times when teenagers access HIV-related mHealth information. The findings indicate that the evening hours are the most popular time, with 46.4% of respondents accessing information around this period. Afternoon hours are the next most common at 31.9%, followed by morning hours at 21.7%. The preference for evening hours (46.4%) suggests that this period may offer teenagers the most conducive environment for accessing mHealth information. This could be due to a variety of factors such as the availability of privacy, reduced distractions, and perhaps more free time after the day's activities. Evening access might also align with when caregivers or other family members are available to assist, which is crucial for teenagers who rely on others for mobile phone access.

The significant number of teenagers accessing information in the afternoon (31.9%) indicates that this period also provides an opportunity for engagement. Schools or community programs could consider incorporating mHealth education sessions during these hours when teenagers might have structured breaks or after-school activities.The

least preferred morning hours (21.7%) suggest that early parts of the day might be less ideal for mHealth interventions, likely due to school commitments or other morning routines that limit the availability of time and privacy.

The primary reason for choosing specific times to access mHealth information is the availability of mobile phones, cited by 60.1% of respondents. This underscores the importance of ensuring that mobile phones are accessible to teenagers during the times they are most likely to seek information. Interventions might consider facilitating more consistent access to mobile phones for teenagers, possibly through programs that provide dedicated devices or ensure family members are aware of the importance of allowing phone use during these times. Privacy, cited by 27.5%, highlights the need for confidentiality in accessing HIV-related information. This is critical in encouraging teenagers to seek out and use mHealth resources without fear of stigma or breach of privacy. Interventions should ensure that platforms and applications respect user privacy and offer discreet access options. Content downloading ease (8.0%) and instantaneous correspondence (4.3%) are less significant factors but still noteworthy. These reasons suggest that technical factors such as internet speed and responsiveness of the platform can influence when teenagers choose to access information. Improving the technical aspects of mHealth services, such as ensuring fast download times and real-time interaction capabilities, can enhance user experience and engagement.

Understanding the preferred times and reasons for accessing mHealth information can significantly enhance the effectiveness of mHealth interventions for teenagers living with HIV/AIDS in the island communities of Lake Victoria. By aligning service availability with these preferences and addressing the highlighted needs for privacy, availability, and technical ease, stakeholders can improve the reach and impact of their health education and support programs.

Table 4.16: Time to Access mHealth information and Reason for Choosing Time

Category	Case	
	n = 138	%
Time to access HIV related mHealth information		
Morning hours (Early & Mid-morning).	30	21.7
Afternoon hours (Around noon and afternoon).	44	31.9
Evening hours (Around evening and night).	64	46.4
Reason for reason for choosing time		
Availability of mobile phone.	83	60.1
Privacy.	38	27.5
Content downloads easy.	11	8.0
Correspondence is instantaneous.	6	4.3

The data in Table 4.17 reveals that 44.2% of teenagers do not store mHealth information on their devices, while 31.9% use SD cards, 21.7% use phone memory, and only 2.2% use cloud-based storage.The high percentage of teenagers not storing information (44.2%) suggests a potential gap in the retention of valuable health information, which could affect their ability to refer back to it when needed. This might be due to a lack of storage space, concerns over privacy, or the perceived importance of the information. Interventions should consider ways to ensure that crucial health information is easily accessible and retrievable when needed. Educating teenagers on secure and efficient storage options, such as using SD cards or cloud services, might improve retention and ongoing access to important health information.

Regarding the duration of information storage, the findings indicate that 31% of teenagers delete information immediately after reading it. Other significant durations include deleting information after a week (23%), after a month (21%), after one day (18%), and after two days (4%). The tendency to delete information soon after reading, as indicated by the 31% who delete it immediately, suggests concerns over privacy and device storage capacity. This highlights the importance of designing mHealth interventions that consider the transient nature of information retention among teenagers. To address this, mHealth programs could include features that allow easy re-access or re-download of previously viewed content without compromising privacy. Moreover,

ensuring that information is concise and easy to digest in one sitting can be crucial for effectiveness.

The primary reasons for deleting information include the need for privacy (42%), fear of stigma and discrimination (20.3%), and concerns over bulkiness (15.2%). Other reasons include system design (14.5%) and perceived insecurity of information (8%). The need for privacy and fear of stigma are significant factors driving the deletion of mHealth information. This underscores the importance of designing mHealth platforms with robust privacy features that protect user anonymity and confidentiality. Features such as password protection, discreet app icons, and secure messaging could help alleviate concerns and encourage more sustained engagement with mHealth resources. The concern over the bulkiness of information suggests a need for optimizing the content size and ensuring that it does not overwhelm the device's storage capacity. mHealth solutions should aim to provide concise, relevant information in manageable chunks that can be easily stored and accessed without consuming excessive space.

Finally, the 14.5% who delete information because "that is how the system is designed" indicate a need for user education. mHealth programs should include clear instructions on the importance of information retention and how to manage storage settings effectively. The findings highlight the critical balance between providing accessible, secure, and manageable mHealth information storage solutions and addressing the privacy concerns of teenagers living with HIV/AIDS in island communities of Lake Victoria. By understanding these preferences and challenges, stakeholders can enhance the design and delivery of mHealth interventions, ensuring they are both effective and user-friendly.

Table 4.17: mHealth Information Storage, Duration, and Reason for Deletion Period

Category	Case n = 138	%
Method of information storage		
SD Card.	44	31.9
Phone memory.	30	21.7
Cloud-based.	3	2.2
Do not store information.	61	44.2
Duration of information storage		
Delete information after a month.	29	21
Delete information after a week.	32	23
Delete information after two days.	6	4
Delete information after one day.	25	18
Delete information after reading.	47	31
Reasons for deletion of information		
Bulkiness of information	21	15.2
Need privacy	58	42.0
Insecure information	11	8.0
That is how the system is designed	20	14.5
Fear of stigma and discrimination	28	20.3

The data indicates that the majority of information shared on mHealth pertains to HIV treatment (50%), followed by new programs in HIV management by the government (23.9%), HIV transmission (15.2%), stigma and discrimination (9.4%), and research on HIV (1.4%).The emphasis on HIV treatment reflects a critical need among teenagers for ongoing support and knowledge about managing their condition. This underscores the importance of focusing mHealth content on practical and immediate health management strategies. Additionally, the significant interest in new government programs (23.9%) suggests that updates and announcements regarding public health initiatives are well-received, indicating that teenagers are eager to stay informed about broader efforts in HIV management. The lower percentage of information shared about stigma and discrimination (9.4%) and HIV research (1.4%) suggests potential gaps that could be addressed to provide a more holistic view of living with HIV and encourage a broader understanding of the disease and its social impacts.

Currently, HIV treatment information remains the most popular content (41.3%), followed by new government programs (34.8%), stigma and discrimination (15.2%), HIV transmission (5.8%), and HIV research (2.9%).The consistent popularity of HIV treatment information highlights its ongoing relevance and the critical need for accessible treatment-related content. The significant interest in new programs (34.8%) also indicates that teenagers are looking for updated and actionable information. The increased attention to stigma and discrimination (15.2%) compared to what is mostly shared suggests a growing awareness and need to address social challenges faced by HIV-positive teenagers. The relatively low interest in HIV transmission and research points to a need for more engaging and relevant content delivery in these areas to ensure comprehensive education.

Teenagers predominantly share mHealth information with parents/guardians (50%), followed by friends (28.3%), siblings (11.6%), and members of support groups (10.1%). The fact that teenagers share most of their mHealth information with parents/guardians (50%) indicates a reliance on family support for managing their health. This highlights the role of family in the dissemination and reinforcement of health information. The significant sharing with friends (28.3%) also suggests the influence of peer networks in health communication. These findings suggest that mHealth programs should consider involving family and peer networks to enhance the effectiveness of information dissemination and support.

A majority of teenagers (81.9%) reported that they add their views on circulating mHealth information, while 18.1% do not. The high engagement rate (81.9%) indicates that teenagers are not just passive recipients but active participants in the dissemination and discussion of mHealth content. This active engagement can be leveraged to enhance the reach and impact of mHealth interventions, as teenagers can act as peer educators and influencers within their networks. Encouraging this behavior through interactive and participatory content can further strengthen mHealth initiatives.

Social media is the predominant platform for sharing mHealth information (55.1%), followed by NGO-based mobile apps (21.7%) and face-to-face interactions (23.2%).The predominance of social media (55.1%) underscores its importance as a tool for health communication among teenagers. mHealth programs should continue to leverage social media platforms to reach a wider audience. The significant use of NGO-based mobile apps (21.7%) highlights the trust placed in these platforms, suggesting a need for further development and promotion of specialized health apps. Face-to-face interactions (23.2%) remain crucial, emphasizing that digital communication should complement rather than replace personal interactions.

The most appealing aspects of mHealth content are the provision of new information (51.4%), teenage-friendly language (16.7%), simplicity of the message (14.5%), multimedia format (15.9%), and credibility of the source (1.4%). The appeal of new information (51.4%) indicates a strong desire for current and relevant updates. The use of teenage-friendly language (16.7%) and multimedia formats (15.9%) suggests that engaging, accessible, and visually appealing content resonates well with teenagers. Ensuring that mHealth messages are simple to understand (14.5%) is crucial for effective communication. The relatively low importance placed on credibility (1.4%) suggests that while content is primarily valued for its engagement, establishing trust and credibility is still essential for long-term effectiveness. mHealth programs should therefore focus on continuously updating content, using relatable language, and incorporating multimedia elements to maintain interest and engagement.

Table 4.18: mHealth Format in Style, Information Mostly Shared in mHealth, with whom and Platform Used

Information mostly shared on mHealth		
HIV transmission	21	15.2
HIV treatment	69	50.0
New programs in HIV management by government	33	23.9
Researches on HIV	2	1.4
Stigma and discrimination	13	9.4
mHealth content currently in style		
HIV transmission	8	5.8
HIV treatment	57	41.3
New programs in HIV management by government	48	34.8
Researches on HIV	4	2.9
Stigma and discrimination	21	15.2
Whom information is mostly shared with		
Friends	39	28.3
Siblings	16	11.6
Parents/guardians	69	50.0
Members of support group	14	10.1
Whether teenagers added views on circulating mHealth information		
Yes	113	81.9
No	25	18.1
Platform mostly used to share mHealth information		
Social media	76	55.1
NGO-based Mobile Apps.	30	21.7
Face-to-Face	32	23.2
Why mHealth content is appealing		
New information	71	51.4
Uses language (slung and symbols) that is teenage friendly	23	16.7
Message is simple to understand	20	14.5
It is from sources they(teenagers) know & acknowledge as credible	2	1.4
Comes in a multimedia format (audio and video)	22	15.9

4.8.2 Inferential Analysis for Knowledge Management

Correlation Analysis

The correlation analysis between knowledge management and access to treatment yielded a significant positive correlation ($R = 0.549$, $p < 0.001$). This indicates a strong

relationship between knowledge management practices and the ability of teenagers to access treatment for HIV/AIDS. The positive correlation suggests that as knowledge management practices improve, access to treatment also tends to increase among teenagers living with HIV/AIDS in island communities of Lake Victoria. This implies that effective knowledge management strategies, such as providing comprehensive information about treatment options, adherence, and available healthcare services, contribute to better access to treatment services for teenagers with HIV/AIDS. The findings underscore the critical role of knowledge management in improving health outcomes. Implementing robust knowledge management strategies that ensure accurate and timely dissemination of information can empower teenagers to make informed decisions about their health and seek appropriate treatment.

Healthcare interventions focusing on enhancing knowledge management practices can potentially lead to improved access to treatment for teenagers living with HIV/AIDS. By equipping them with relevant information about available treatment options and healthcare services, barriers to accessing treatment, such as lack of awareness or understanding, can be mitigated. The strong correlation emphasizes the need for holistic approaches that integrate knowledge management into healthcare delivery systems. This includes initiatives such as peer education programs, digital health platforms, and community-based interventions aimed at promoting health literacy and improving access to treatment services. Healthcare providers and policymakers should prioritize tailored information dissemination strategies that address the unique needs and preferences of teenagers. By utilizing diverse communication channels and culturally sensitive approaches, knowledge management efforts can effectively reach and engage this vulnerable population, ultimately improving their access to treatment and overall health outcomes.

Table 4.19: Correlation Analysis of Knowledge Management

		Access to Treatment
Access to Treatment	R	1.000
	Sig. (2-tailed)	.
	N	
Knowledge Management	R	.549
	Sig. (2-tailed)	.000
	N	138

The significant positive correlation between knowledge management and access to treatment among teenagers living with HIV/AIDS in island communities of Lake Victoria aligns with previous research findings emphasizing the importance of knowledge dissemination and health education in healthcare settings. Several studies have highlighted the role of knowledge management practices in improving health outcomes and treatment access among various populations. For instance, a study by Parker and Ratzan (2010) emphasized the significance of health literacy and knowledge management in empowering individuals to navigate complex healthcare systems and make informed decisions about their health. Similarly, Berkman et al. (2011) found that patients with higher health literacy levels are more likely to adhere to treatment regimens and engage in preventive health behaviors. These findings corroborate the notion that effective knowledge management practices, such as providing clear and accessible health information, can positively impact treatment access and health outcomes.

Furthermore, research by Sørensen et al. (2012) highlighted the importance of tailored communication strategies in health education and knowledge dissemination. The study emphasized the need for culturally sensitive approaches that consider the diverse needs and preferences of target populations. Similarly, Nutbeam (2008) discussed the concept of health literacy as a key determinant of health outcomes, emphasizing the importance of addressing literacy barriers and promoting health education initiatives.Overall, the findings from your study corroborate with previous research suggesting that knowledge management plays a critical role in improving treatment access and health outcomes

among diverse populations. By implementing effective knowledge dissemination strategies and prioritizing health education initiatives, healthcare systems can empower individuals to make informed decisions about their health and access appropriate treatment services. These findings underscore the importance of integrating knowledge management practices into healthcare delivery systems to enhance patient outcomes and promote overall well-being.

Regression Analysis

This study applied a regression model to identify the effect of knowledge management and impact on access to treatment by teenagers living with HIV. Regression analysis was conducted to determine the proportion of access to treatment (dependent variable) which could be predicted by knowledge management (independent variable). It was hypothesized that:

H_{a2}: There is significant relationship between knowledge management and treatment access by teenagers living with HIV from island communities of Lake Victoria

To test this hypothesis, the model $Y= \beta_0 + \beta_2 X_2 + \varepsilon$ was fitted. Where Y is treatment access by teenagers living with HIV from island communities of Lake Victoria X_2 is Knowledge Management

Regression model summary results in Table 4.20 below indicate the relationship between knowledge management and access to treatment reveals a moderate positive correlation (R = 0.498), with the coefficient of determination (R Square) indicating that approximately 24.8% of the variance in access to treatment can be explained by knowledge management practices. The adjusted R Square, which considers the number of predictors in the model, is 20.2%, indicating that knowledge management accounts for a significant portion of the variance in access to treatment while adjusting for the complexity of the model.

The moderate positive correlation suggests that knowledge management practices are moderately associated with access to treatment among teenagers living with HIV/AIDS in island communities of Lake Victoria. The R Square value indicates that approximately one-fourth of the variability in access to treatment can be attributed to knowledge management efforts. The findings highlight the importance of effective knowledge management strategies in facilitating access to treatment for teenagers with HIV/AIDS. Investing in initiatives that enhance knowledge dissemination and health education can potentially improve treatment-seeking behaviors and health outcomes among this population.

Healthcare providers and policymakers should prioritize interventions aimed at strengthening knowledge management systems within healthcare settings. This includes developing educational materials, training healthcare professionals, and leveraging digital technologies to ensure the timely and accurate dissemination of information. While knowledge management explains a significant portion of the variance in access to treatment, there is room for further improvement. Continuous monitoring and evaluation of knowledge management programs are essential to identify areas for enhancement and ensure that information is effectively reaching and empowering teenagers to access treatment. Given the multifaceted nature of knowledge management, collaborative efforts involving healthcare professionals, community organizations, and educational institutions are crucial. By working together, stakeholders can synergize their efforts to create comprehensive and sustainable knowledge management systems that support improved access to treatment and overall health outcomes for teenagers living with HIV/AIDS..

Table 4.20: Model Summary (Knowledge Management and Access to Treatment)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.498a	.248	.202	1.455

a. Predictors: (Constant), Knowledge Management

The ANOVA results for the relationship between knowledge management and treatment access reveal a significant F-value of 44.922, with a corresponding p-value of .000, indicating that the regression model is statistically significant. This suggests that the variation in treatment access can be partially explained by changes in knowledge management practices. The significant F-value implies that the regression model, which includes knowledge management as a predictor of treatment access, provides a better fit to the data compared to a model with no predictors. In other words, knowledge management significantly contributes to explaining the variability in treatment access among teenagers living with HIV/AIDS in island communities of Lake Victoria.

The findings underscore the critical role of knowledge management in influencing treatment access for teenagers with HIV/AIDS. Healthcare organizations should prioritize efforts to enhance knowledge management practices, including the creation, dissemination, and utilization of health-related information. Given the significant impact of knowledge management on treatment access, healthcare facilities and organizations may consider allocating resources to support initiatives aimed at improving health literacy, patient education, and information dissemination strategies. Training programs and capacity-building initiatives targeting healthcare professionals and community health workers should emphasize the importance of effective knowledge management techniques. This includes training on how to communicate health information effectively, utilize digital health technologies, and engage with patients to facilitate treatment access.

Moreover, continuous evaluation and monitoring of knowledge management efforts are essential to ensure their effectiveness and relevance. Healthcare organizations should

regularly assess the impact of their knowledge management strategies on treatment access outcomes and make adjustments as needed to optimize results Collaboration between healthcare providers, policymakers, community organizations, and other stakeholders is crucial to develop comprehensive and sustainable knowledge management solutions. By working together, stakeholders can leverage their collective expertise and resources to address the complex challenges associated with treatment access for teenagers living with HIV/AIDS..

Table 4.21: ANOVA Statistics (Knowledge Management and Treatment Access)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	90.160	1	90.160	44.922	.000[b]
	Residual	272.920	136	2.007		
	Total	363.080	137			

a. Dependent Variable: Access to Treatment
b. Predictors: (Constant), Knowledge Management

Regression of coefficients results in Table 4.22 below shows that regression coefficients table indicates that both the constant term and the coefficient for knowledge management are statistically significant predictors of treatment access among teenagers living with HIV/AIDS from island communities of Lake Victoria. The constant term (intercept) has a value of 6.876, indicating the expected value of treatment access when the knowledge management score is zero. However, since knowledge management cannot be zero in practical terms, the interpretation focuses on the coefficient for knowledge management.

The regression equation can be represented as follows:

Treatment Access = 6.876 + 0.512 (Knowledge Management) Treatment Access=6.876+0.512 (Knowledge Management)

For every one-unit increase in the knowledge management score, treatment access increases by 0.512 units, holding all other variables constant. This suggests that

teenagers living with HIV/AIDS who have higher levels of knowledge management, which includes factors such as information dissemination, health education, and health literacy, are more likely to have better access to treatment services. In conclusion, the significant relationship between knowledge management and treatment access highlights the critical role of information dissemination and health education in improving healthcare outcomes for teenagers living with HIV/AIDS. By investing in effective knowledge management strategies and adopting patient-centered care approaches, healthcare systems can enhance treatment access, promote better health outcomes, and ultimately improve the quality of life for this vulnerable population group

Table 4.22: Regression Coefficients (Knowledge Management and Treatment Access

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	**Std. Error**	**Beta**	**T**	**Sig.**
1	(Constant)	6.876	.436		15.771	.000
	Knowledge Management	.512	.031	.449	16.516	.000

a. Dependent Variable: Treatment access by teenagers living with HIV from island communities of Lake Victoria.

The findings that indicate a significant positive relationship between knowledge management and treatment access among teenagers living with HIV/AIDS from island communities of Lake Victoria align well with previous research in the field of healthcare and health education. Several studies have highlighted the importance of knowledge management in improving healthcare outcomes and access to treatment. Firstly, the critical role of health literacy in enhancing patients' ability to access and understand health information is well-documented. Nutbeam (2008) discussed that health literacy leads to better health outcomes by enabling patients to make informed decisions regarding their health. The significant coefficient for knowledge management (0.512) in your study underscores this connection by demonstrating that improved knowledge management directly correlates with increased treatment access. Similarly, Osborne et

al. (2013) found that higher health literacy levels are associated with better health management and treatment adherence among individuals with chronic diseases, including HIV/AIDS.

Effective communication and information dissemination are also crucial in healthcare settings. Kreps and Thornton (1992) emphasized that well-informed patients are more likely to engage in proactive health behaviors and adhere to treatment plans. The positive impact of knowledge management on treatment access in your study supports this idea by showing that better dissemination of information leads to improved healthcare access. Additionally, Berkman et al. (2011) provided evidence that patient education and clear communication significantly enhance patients' understanding of their health conditions and treatment options, leading to better adherence to prescribed treatments and improved health outcomes.

Moreover, patient education empowers individuals to take control of their health. Feste and Anderson (1995) highlighted this empowerment, which is crucial for teenagers living with HIV/AIDS as it encourages them to seek and adhere to treatment regimens. Your findings indicate that improved knowledge management can significantly enhance treatment access, consistent with the notion that education empowers patients. Furthermore, Suhonen et al. (2018) suggested that patient-centered care, which includes comprehensive health education and personalized information dissemination, is essential for improving treatment adherence and health outcomes. The significant relationship between knowledge management and treatment access in your study highlights the importance of adopting patient-centered approaches in healthcare delivery

Based on these findings, several practical implications and recommendations can be made. Healthcare providers and policymakers should invest in health education programs that enhance the knowledge and health literacy of teenagers living with HIV/AIDS. These programs should focus on providing accurate and accessible information about HIV treatment and care. Additionally, digital health platforms can be used to disseminate information and educate patients more effectively. mHealth apps,

online portals, and social media can serve as valuable tools for reaching teenagers and providing them with the necessary knowledge to manage their health.

Training healthcare providers in effective communication and knowledge management strategies is also crucial. Providers should be equipped to deliver clear, concise, and relevant health information to teenagers living with HIV/AIDS, fostering better understanding and treatment adherence. Furthermore, community-based interventions that leverage local resources and support networks can enhance the dissemination of health information. Community health workers can play a vital role in educating teenagers and improving their access to treatment services.

The findings from the study, showing a significant positive relationship between knowledge management and treatment access, are consistent with existing literature on the importance of health literacy, information dissemination, and patient education in healthcare. By prioritizing these aspects, healthcare systems can significantly improve treatment access and health outcomes for teenagers living with HIV/AIDS in island communities of Lake Victoria. This alignment with previous research underscores the universal relevance of knowledge management in enhancing healthcare delivery and patient outcomes.4.9 Technology Obsolescence

4.9.1 Descriptive Analysis for Technology Obsolescence

In this section the study intended to establish the mobile phone changed, reasons for changing and information packaged aligns to teenager's phone usage to access treatment. The study sough to establish the number of times the teenagers had changed their phone numbers in the past 5 years covering the study period that is from the year 2013 up to 2017. From Table 4.23 below, the result indicated that 34% had changed their mobile phones once, 25% had changed their mobile phones twice, 19% had changed their phones three times while those who had changed their phones four and five times were 9% a piece. Those who had changed 6 times were 2% while those who had never changed was 1%. The study results imply that teenagers do change their

phones to access treatment through mHealth in the Islands of Victoria. The able 4.23 provides insights into the frequency of mobile phone changes among teenagers, the reasons behind these changes, and how information is packaged to align with teenagers' phone usage habits. Regarding the frequency of mobile phone changes, the data show that a substantial number of teenagers have changed their phones at least once, with some even changing them multiple times. This indicates a high degree of turnover in mobile devices among this demographic, which could be attributed to factors such as technological advancements, peer influence, and individual preferences.

In addition, the study sought to investigate reasons for changing the mobile phones for the study period. It was established that that most of the teenagers (46%) did change their phones because the phones had problems with memory, 33% posited due to phones had problems with batteries, 26% cited that they had to also upgrade because of what their friends had, 18% changed because their phone models were wiped off the market and 15% did change their phones because some apps could not be downloaded. This imply that teenagers changed mobile phones due to a variety of reasons so that they could access treatment through mHealth in the Island communities of Lake Victoria. Examining the reasons for changing mobile phones reveals several key drivers. The most common reasons cited include technical issues such as memory and battery problems, as well as the inability to download certain applications on older devices. Additionally, social influences, such as friends purchasing new phones, also play a role in teenagers' decisions to change their devices. These findings suggest that both intrinsic and extrinsic factors contribute to teenagers' mobile phone choices, highlighting the complex interplay between individual needs and social dynamics in shaping technology adoption.

Further, pertaining to whether mHealth information was packaged in line with how the teenagers communicate to their peers, majority at 47.1% were not sure, 45.7% observed that it did not while only 7.2% agreed it was packaged in line with the phone’s usage. They also indicated that, wished that the language used could be changed (49%), 32% wished that the time of sending the messages could be changed while 57% felt that the

text format could be changed. Furthermore, the table indicates that information packaging is tailored to accommodate teenagers' phone usage preferences. This includes considerations such as language usage, timing of message delivery, and text formatting. By aligning information packaging with teenagers' phone usage habits, healthcare providers and educators can enhance the effectiveness of mobile health (mHealth) interventions and improve engagement with health-related content. Additionally, this approach reflects a user-centric design philosophy, which prioritizes the needs and preferences of the target audience.

Table 4.23: Mobile Phone Changed, Reasons for Changing and Information Packaged Aligns to Teenager's Phone Usage

Category	Case	
	n = 138	%
Number of times a mobile phone has been changed		
Once		34
Twice		25
Three times		19
Four times		9
Five times		9
Six times		1
Never		1
Reason for changing mobile phone		
My model was wiped off the market		18
My friends bought new ones so copied them		26
My phone had problems with memory		46
My phone had problems with battery power		33
Some Apps cannot be downloaded in my old phone		15
Information packaged in line with teenager's phone usage		
Language used		49
Time of sending messages		32
Format text		57

4.9.2 Inferential Analysis for Technology Obsolescence

Correlation Analysis

The correlation analysis presented in Table 4.24 examines the relationship between technology obsolescence and access to treatment among teenagers living with HIV/AIDS in island communities of Lake Victoria. The correlation coefficient (R) of 0.346 indicates a moderate positive correlation between these variables. This suggests that as technology obsolescence increases, access to treatment also tends to increase among the target population. The statistically significant p-value ($p < 0.001$) indicates that this correlation is unlikely to have occurred by chance. Instead, it suggests a meaningful relationship between technology obsolescence and access to treatment. One possible interpretation of this finding is that advancements in technology, despite the potential for devices to become outdated, may contribute to improved access to healthcare services, including HIV/AIDS treatment, among teenagers in island communities. Implications of this correlation include the need for ongoing investment in technology infrastructure and digital health solutions to ensure that teenagers in remote or underserved areas have access to up-to-date healthcare resources. Additionally, it underscores the importance of leveraging technological innovations, such as mobile health (mHealth) platforms and telemedicine, to overcome geographical barriers and enhance healthcare delivery in resource-limited settings.

Moreover, understanding the relationship between technology obsolescence and access to treatment can inform strategic planning and policy development aimed at improving health outcomes among adolescents living with HIV/AIDS. By recognizing the role of technology in facilitating access to treatment, stakeholders can prioritize initiatives that promote digital literacy, expand internet connectivity, and support the adoption of innovative healthcare technologies in island communities. In summary, the correlation analysis highlights the potential impact of technology obsolescence on access to treatment for teenagers living with HIV/AIDS. By acknowledging and addressing the challenges associated with outdated technology, healthcare providers, policymakers, and

technology developers can work together to create more equitable and effective healthcare systems for vulnerable populations.

Table 4.24: Correlation Analysis of Technology Obsolescence

		Access to Treatment
Access to Treatment	R	1.000
	Sig. (2-tailed)	.
	N	
Technology Obsolescence	R	.346
	Sig. (2-tailed)	.000
	N	138

The findings from the correlation analysis in Table 4.24, which demonstrate a significant positive relationship between technology obsolescence and access to treatment among teenagers living with HIV/AIDS in island communities of Lake Victoria, align with previous research on the role of technology in healthcare access and outcomes. Källander et al. (2013) emphasized the importance of modern technology in enhancing health outcomes, particularly in low-resource settings. Their study highlighted that mobile health (mHealth) interventions, when supported by up-to-date technological infrastructure, significantly improve access to care and adherence to treatment. This aligns with the current finding that mitigating technology obsolescence can enhance treatment access for teenagers living with HIV/AIDS.

Research by Vicente and López (2011) on the digital divide supports the notion that outdated technology can exacerbate health disparities. Their findings indicated that communities with limited access to modern technology face significant barriers to healthcare services and information. The positive correlation ($R = 0.346$) found in the current study suggests that addressing these technological barriers can improve healthcare access, corroborating the idea that reducing the digital divide is crucial for better health outcomes. A study by Karanja et al. (2011) demonstrated the effectiveness of mobile phone technology in promoting adherence to HIV treatment. They found that

mobile reminders and follow-ups facilitated by modern mobile technologies significantly improved adherence rates among HIV patients. This supports the current study's implication that addressing technology obsolescence can enhance treatment access and adherence for teenagers living with HIV.

Aranda-Jan, Mohutsiwa-Dibe, and Loukanova (2014) conducted a systematic review on mHealth interventions in resource-constrained settings and found that the success of these interventions often depends on the availability and modernity of technology infrastructure. Their review indicated that mHealth projects struggle with sustainability and effectiveness if they fail to address technology obsolescence. This finding corroborates the current study's suggestion that ongoing investment in technology infrastructure is essential for improving healthcare access.Baker et al. (2018) discussed how robust technology infrastructure is vital for efficient health service delivery. Their research suggested that outdated or inadequate technology hinders the ability of healthcare systems to provide timely and effective services. This is consistent with the current study’s findings that technology obsolescence affects treatment access and highlights the need for investments in modern technology.

In summary, the correlation analysis highlighting the significant positive relationship between technology obsolescence and access to treatment for teenagers living with HIV/AIDS is supported by existing literature. Studies consistently show that modern technology infrastructure is crucial for enhancing healthcare access and outcomes. Addressing technology obsolescence through targeted interventions, improved digital literacy, and strategic partnerships can significantly enhance treatment access and adherence for teenagers living with HIV in resource-constrained settings

Regression Analysis

This study applied a regression model to identify the effect of technology obsolescence and impact on access to treatment by teenagers living with HIV. Regression analysis was conducted to determine the proportion of access to treatment (dependent variable)

which could be predicted by technology obsolescence (independent variable). It was hypothesized that:

H_{a2}: There is significant relationship between technology obsolescence and treatment access by teenagers living with HIV from island communities of Lake Victoria.

To test this hypothesis, the model $Y= \beta_0 + \beta_3 X_3 + \varepsilon$ was fitted. Where Y is treatment access by teenagers living with HIV from island communities of Lake Victoria X_3 is technology obsolescence.

Regression model summary results in Table 4.25 provides insights into the relationship between technology obsolescence and access to treatment among teenagers living with HIV/AIDS in island communities of Lake Victoria. The coefficient of determination (R squared) of 0.362 indicates that approximately 36.2% of the variance in access to treatment can be explained by technology obsolescence. This suggests a moderate level of association between these variables, indicating that technology obsolescence may play a significant role in influencing access to treatment for this population.

The adjusted R squared value of 0.252, which considers the number of predictors in the model, suggests that around 25.2% of the variance in access to treatment can be attributed specifically to technology obsolescence after accounting for other factors. This highlights the unique contribution of technology obsolescence to the access-to-treatment outcome, emphasizing its importance as a predictor variable in understanding healthcare access among teenagers living with HIV/AIDS. Implications of these findings include the recognition of technology obsolescence as a potential barrier to accessing treatment for teenagers in island communities. Outdated technology infrastructure, including obsolete devices and limited internet connectivity, may hinder individuals' ability to utilize digital health resources and access essential healthcare services. Therefore, efforts to address technology obsolescence, such as upgrading infrastructure and providing access to newer technologies, may be necessary to improve healthcare access and outcomes for this population.

Furthermore, the model summary underscores the need for tailored interventions and policies that address the specific challenges posed by technology obsolescence in healthcare delivery. This may involve investments in digital infrastructure, capacity building in technology literacy, and the development of mHealth solutions optimized for low-resource settings. By addressing technology obsolescence effectively, healthcare stakeholders can help ensure equitable access to treatment and support better health outcomes for teenagers living with HIV/AIDS in island communities.

Table 4.25: Model Summary (Technology Obsolescence and Access to Treatment)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.476a	.362	.252	1.342

a. Predictors: (Constant), Technology Obsolescence

The ANOVA statistics presented in Table 4.26 demonstrate the significance of the regression model in explaining the relationship between technology obsolescence and treatment access among teenagers living with HIV/AIDS in island communities of Lake Victoria. The regression model's F-statistic of 77.178 is associated with a p-value of less than 0.001, indicating that the regression model is statistically significant. This suggests that the independent variable, technology obsolescence, has a significant impact on the dependent variable, access to treatment, for this population. The sum of squares for regression (131.435) represents the variance in access to treatment that can be explained by technology obsolescence, while the sum of squares for the residual (231.645) represents the unexplained variance. The substantial difference between these values suggests that technology obsolescence accounts for a significant proportion of the variability in treatment access among teenagers living with HIV/AIDS in island communities. These findings have important implications for healthcare policymakers and practitioners. Addressing technology obsolescence through infrastructure development, technology upgrades, and digital literacy programs may be crucial for improving treatment access and healthcare outcomes for this vulnerable population.

Additionally, targeted interventions aimed at reducing disparities in technology access and usage could help mitigate the impact of technology obsolescence on treatment access, ultimately contributing to more equitable healthcare delivery in island communities.

Table 4.26: ANOVA Statistics (Technology Obsolescence and Treatment Access.)

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	131.435	1	131.435	77.178	.000[b]
	Residual	231.645	136	1.703		
	Total	363.080	137			

a. Dependent Variable: Access to Treatment
b. Predictors: (Constant), Technology Obsolescence

Regression of coefficients results in Table 4.27 offer insights into the relationship between technology obsolescence and treatment access among teenagers living with HIV/AIDS in island communities of Lake Victoria. The constant term (2.896) represents the expected value of treatment access when technology obsolescence is zero. In this case, it signifies the baseline level of treatment access for individuals in the absence of technology obsolescence. The coefficient for technology obsolescence (0.469) indicates the change in treatment access for each unit increase in technology obsolescence, holding all other variables constant. This coefficient is statistically significant with a p-value of less than 0.001, suggesting that technology obsolescence has a positive and significant effect on treatment access. The standardized coefficient (0.362) further confirms the strength and direction of this relationship, implying that technology obsolescence accounts for a considerable proportion of the variability in treatment access among teenagers living with HIV/AIDS in island communities. The equation representing the relationship between technology obsolescence (TO) and treatment access (TA) for teenagers living with HIV/AIDS in island communities of Lake Victoria can be expressed as:

$$TA = 2.896 + 0.469 \times TO$$

In this equation:

- TA represents treatment access, which is the dependent variable.
- TO represents technology obsolescence, the independent variable.
- 2.896 is the intercept or constant term, indicating the expected treatment access when technology obsolescence is zero.
- 0.469 is the regression coefficient for technology obsolescence, representing the change in treatment access for each unit increase in technology obsolescence.

These findings underscore the importance of addressing technology obsolescence as a barrier to treatment access in resource-constrained settings. Initiatives aimed at upgrading technology infrastructure, improving digital literacy, and providing access to modern healthcare technologies could help mitigate the adverse effects of technology obsolescence on healthcare outcomes for this vulnerable population. Additionally, fostering partnerships between healthcare providers, technology developers, and policymakers may facilitate the development and implementation of targeted interventions to address these challenges effectively.

Table 4.27: Regression Coefficients (Technology Obsolescence and Treatment Access

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	**Std. Error**	**Beta**	**T**	**Sig.**
1	(Constant)	2.896	.543		5.320	.000
	Technology Obsolescence	.469	.171	.362	2.743	.000

a. Dependent Variable: Treatment access by teenagers living with HIV from island communities of Lake Victoria.

The findings from Table 4.27, which demonstrate a significant positive relationship between technology obsolescence and treatment access among teenagers living with HIV/AIDS in island communities of Lake Victoria, align with and corroborate previous studies in this field. Existing literature emphasizes the critical role of up-to-date technology in enhancing healthcare access and outcomes, particularly for marginalized

populations. Källander et al. (2013) found that integrating modern technology into health systems significantly improves health outcomes in low-resource settings. Their study showed that mobile health (mHealth) interventions, which often rely on current technological infrastructure, enhance access to care, adherence to treatment, and overall health outcomes. This aligns with the current finding that reducing technology obsolescence can improve treatment access for teenagers living with HIV/AIDS.

The concept of the digital divide, as explored by Vicente and López (2011), highlights how outdated technology can exacerbate health disparities. Their research indicated that communities with limited access to modern technology face significant barriers in accessing healthcare services and information. The positive coefficient for technology obsolescence in the current study (0.469) supports this notion by illustrating that overcoming technological barriers can lead to better healthcare access. A study by Karanja et al. (2011) emphasized the role of mobile phone technology in promoting adherence to HIV treatment. They found that mobile reminders and follow-ups facilitated by modern mobile technologies significantly improved adherence rates among HIV patients. This supports the current study's implication that addressing technology obsolescence can enhance treatment access and adherence for teenagers living with HIV.

Research by Aranda-Jan, Mohutsiwa-Dibe, and Loukanova (2014) on mHealth interventions in resource-constrained settings found that modern, functional technology is essential for the success of these interventions. Their systematic review indicated that mHealth projects that fail to consider the obsolescence of technology often struggle with sustainability and effectiveness. This corroborates the current finding that technology obsolescence is a significant factor affecting treatment access. Baker et al. (2018) discussed how robust technology infrastructure is vital for efficient health service delivery. Their findings suggested that outdated or inadequate technology hinders the ability of healthcare systems to provide timely and effective services. This is consistent with the current study's suggestion that initiatives aimed at upgrading technology infrastructure can mitigate the adverse effects of technology obsolescence on healthcare outcomes. In summary, the positive and significant relationship between technology

obsolescence and treatment access found in the current study is well-supported by existing research. Studies consistently show that modern technology infrastructure is crucial for improving healthcare access and outcomes. Addressing technology obsolescence through targeted interventions, improved digital literacy, and strategic partnerships can significantly enhance treatment access and adherence for teenagers living with HIV in resource-constrained settings

4.10 Community Based Health Systems

4.10.1 Descriptive Analysis for Community Based Health Systems

Regarding the above objective, there was the need to establish whether the teenagers had been involved in message development, social marketing and community entry of the mHealth Apps they have engaged with. The results in Table 4.28 below showed that 2.1% of the teenagers who have been involved in message development, were involved in selecting mHealth HIV message package, 6.5% were involved in developing prototype of mHealth HIV message, 2.9% who were involved in pretesting of mHealth HIV message prototype as well as process monitoring of utilization of mHealth HIV message package and 84.80% were not involved at any stage of message development for mHealth. The study results indicate that the teenagers had been involved in message development, in selecting mHealth HIV message package, developing prototype of mHealth HIV message as well as process monitoring of utilization of mHealth HIV message package.

The Table 4.28 presents statistics on teenagers' involvement in the development, marketing, and community entry of mHealth applications, along with considerations for sustainable funding and incentivization. It reveals that a large proportion of teenagers were not involved in the various stages of message development, social marketing, and community entry for mHealth apps, indicating a potential gap in engaging them in the process. However, some level of participation was observed in identifying partners for

social marketing and conducting livelihoods analysis for community entry, suggesting a partial involvement in certain aspects of the mHealth program.

Pertaining to whether the respondents have been involved in social marketing activities of mHealth Apps, 16% of the teenagers posited that they identified the influencers, 49% respondents had been involved but 88 respondents had not been involved. From those who had participated in social marketing activities, 16 respondents were involved in the identification of influencers, 33 were involved in the identification of partners and 51% were not involved in social marketing activities. The study findings imply that involvement in social marketing of mHealth Apps was not for identification of the influencers or partners.

In addition, the study sought to examine the teenagers' level of community entry and the study results indicated that 2.9% identified objectives and evaluation criteria for mHealth indicators; 30.4% stated that they conducted livelihoods analysis on teenagers living with HIV, Education of teenagers on mHealth access and utilization, 9.4% of the teenagers indicated that they mapped community linkages for teenagers on mHealth and 52.5% indicated that they did not involve in community entry. This can be deduced that teenagers' level of community entry was low in the communities in Islands of Victoria.

The study went further to find out who could sustainably fund mHealth Apps for the use of teenagers to access treatment. The study found out that majority of the teenagers indicated that NGOs played a big role to fund mHealth Apps (58.0%), the CBOs also funded (35.5%), 3.6% of the respondents indicated that the church could fund mHealth Apps and existing health facility also funded the mHealth Apps (3.6%). The study results indicated that NGOs played a big role to fund mHealth Apps for the teenagers to access treatment for the communities living with HIV in Islands of Victoria.

The study also sought to examine on the teenagers incentivization to use mHealth Apps. The study findings indicated that 18.10% of the respondents indicated provision of airtime, 20.30% of the respondents stated awarding of points of accessing the Apps,

10.10% of the respondents indicated purchase of mobile phones for teenagers, 2.90% indicated facilitation of exchange tours and 48.60% of the respondents stated none of the above. This indicated that awarding of points of accessing the Apps, purchase of mobile phones for teenagers and indicated facilitation of exchange tours could not enhance teenager's incentivization to use mHealth Apps in communities in Islands of Lake Victoria.

Regarding sustainable funding, the majority of respondents indicated NGOs as potential sources, followed by community-based organizations (CBOs). This underscores the importance of partnerships with such organizations in ensuring the long-term sustainability of mHealth initiatives. Additionally, the provision of incentives for teenagers to use mHealth apps, such as the provision of airtime and awarding points for accessing the apps, highlights the need for tailored strategies to encourage consistent engagement and utilization among the target demographic. Overall, the findings suggest the importance of actively involving teenagers in the development and implementation of mHealth programs to ensure their relevance and effectiveness. Additionally, establishing sustainable funding mechanisms and designing appropriate incentives are crucial for the successful adoption and continued utilization of mHealth apps among teenagers living with HIV/AIDS in island communities of Lake Victoria.

Table 4.28: Teenager's Involvement in Message Development, Social Marketing and Community Entry

Category	**Case**	
	n = 138	**%**
Involvement in message development of mHealth Apps		
Selecting mHealth HIV message package	4	2.9
Developing prototype of mHealth HIV message	9	6.5
Pretesting of mHealth HIV message prototype	4	2.9

Process monitoring of utilization of mHealth HIV message package	4	2.9
Not involved at any stage	117	84.8
Involvement in social marketing of mHealth Apps		
Identification of influencers	16	
Identification of partners	33	
Not involved in social marketing activities	51	
Involvement in community entry for mHealth Apps		
Identify objectives and evaluation criteria for mHealth indicators	4	2.9
Conduct livelihoods analysis on teenagers living with HIV	42	30.4
Education of teenagers on mHealth access and utilization	13	9.4
Mapping of community linkages for teenagers on mHealth	7	5.1
Not involved in community entry	72	52.2
Who can sustainably fund mHealth Apps?		
The church	5	3.6
Health facility	4	2.9
NGOs	80	58.0
CBOs	49	35.5
Teenagers incentivization to use mHealth Apps		
Provision of airtime	25	18.1
Awarding of points of accessing the Apps	28	20.3
Purchase of mobile phones for teenagers	14	10.1
Facilitation of exchange tours	4	2.9
None	67	48.6

The study investigated on the usage of Apps that prompts referral for medical attention by the teenagers in the study area. The study findings in Table 4.29 below indicated that 32.6% of the respondents stated drug picking, 30.40% indicated drug taking, 37.0% of the respondents indicated did not use a phone to prompt appointments. On the method

for prompt via mHealth, 48.60% of the respondents indicated mobile phone alarm with dates, 13.0% got calls from the health facility, 1.40% Pre-set SMS to send to self and 37.0% did not use a phone to prompt appointments.

The study sought to examine the usage of apps that prompts referral for medical attention, 8.6% of the respondents indicated the sought counseling on HIV issues, 11.50%% of the respondents indicated tested HIV, 5.80% indicated treatment of opportunistic infections and 74.10% stated that they did not use an app that prompted referral. The study findings indicated that usage of apps prompted referral for medical attention, counseling on HIV issues, tested HIV, treatment of opportunistic infections and to some extent prompted referrals.

On what facilitated the process of referral most; 85.50% of the respondents indicated that they did not make referrals using the mHealth App., 7.20% of the respondents stated services were available in their island, 1.40% of the respondents stated distance to health facility was not an issue, 4.3% of the respondents indicated health care workers was receptive and 1.40% of the respondents indicated an operational teenage friendly center at the facility. The study findings imply that make referrals using the mHealth App, services available in their island, distance to health facility, health care workers and operational teenage friendly center at the facility facilitated the process of referral most in the study area**.**

On the referral information desired by teenagers to be on mHealth, 85.5% of the respondents indicated emergency medical attention, 7.2% of the respondents stated place to seek counseling, 1.4% of the respondents indicated place to test for HIV, 4.35 of the respondents stated treatment for opportunistic infections and 1.4% indicated contraceptive information. The study findings indicated that emergency medical attention, place to seek counseling, place to test for HIV, treatment for opportunistic infections and contraceptive information were some of the reasons for referral information desired by teenagers to be on mHealth.

Table 4.29: Use of mHealth Apps to prompt referral for medical attention

Category	Case	
	n = 138	%
Prompts via mHealth		
Drug picking	45	32.6
Drug taking	42	30.4
Did not use a phone to prompt appointments	51	37.0
Method for prompt via mHealth		
Mobile phone alarm with dates	67	48.6
Get calls from the health facility	18	13.0
Pre-set SMS to send to self	2	1.4
Did not use a phone to prompt appointments	51	37.0
Use of Apps that prompts referral for medical attention		
Seek counseling on HIV issues	12	8.6
Testing of HIV	16	11.5
Treatment of opportunistic infections	8	5.8
Did not use an app that prompts referral	103	74.1
What facilitated the process of referral most		
Did not make referrals using the mHealth App.	118	85.5
Services are available in my island	10	7.2
Distance to health facility is not an issue	2	1.4
Health care workers are receptive	6	4.3
An operational teenage friendly center at the facility	2	1.4
Referral information desired by teenagers to be on mHealth		
Emergency medical attention		35
Place to seek counseling		24
Place to test for HIV		14
Treatment for opportunistic infections		64
Contraceptive information		1

4.10.2 Inferential Analysis for Community Based Health Systems

Correlation Analysis

The correlation analysis in Table 4.30 indicates a significant positive correlation between access to treatment and community-based health systems among teenagers living with HIV/AIDS in island communities of Lake Victoria. The correlation coefficient (R) of 0.339 suggests a moderately strong relationship between these two variables. This finding implies that communities with well-established or effective

health systems are more likely to facilitate better access to treatment for teenagers with HIV/AIDS.The significant positive correlation underscores the importance of community-based health systems in supporting and enhancing access to treatment among teenagers living with HIV/AIDS. Community-based health systems often involve local healthcare providers, community health workers, and support networks, which can play vital roles in facilitating access to treatment services, providing education and counseling, and promoting adherence to treatment regimens. Overall, the findings suggest that strengthening community-based health systems could be an effective strategy for improving access to treatment and enhancing overall health outcomes for teenagers living with HIV/AIDS in island communities of Lake Victoria. By leveraging existing community resources and support networks, healthcare interventions can be more effectively delivered and tailored to meet the specific needs of this vulnerable population.

Table 4.30: Correlation Analysis of Community Based Health Systems

		Access to Treatment
Access to Treatment	R	1.000
	Sig. (2-tailed)	.
	N	
Community Based Health Systems	R	.339
	Sig. (2-tailed)	.000
	N	138

The findings from Table 4.30, which indicate a significant positive correlation between access to treatment and community-based health systems among teenagers living with HIV/AIDS in the island communities of Lake Victoria, are corroborated by previous research highlighting the critical role of community health systems in improving health outcomes for vulnerable populations. Firstly, studies have shown that community-based health systems significantly enhance healthcare access and adherence to treatment, particularly in resource-limited settings. For instance, Mwai et al. (2013) found that community health workers (CHWs) improve linkage to care, adherence to antiretroviral therapy (ART), and overall health outcomes among people living with HIV/AIDS. This

aligns with the current finding that well-established community-based health systems positively influence treatment access.

Furthermore, a study by Wouters et al. (2012) emphasized the importance of community support networks in improving adherence to HIV treatment. The involvement of local healthcare providers and community members in the delivery of healthcare services helps to address barriers related to stigma, transportation, and the complexity of navigating healthcare systems. This support is particularly crucial for teenagers who may face unique challenges related to disclosure, stigma, and navigating healthcare independently. Additionally, Nglazi et al. (2012) highlighted that community-based interventions, including home-based care and peer support groups, are effective in enhancing ART adherence and retention in care. These interventions leverage local resources and peer networks, which resonate with the findings that community-based health systems are beneficial for teenagers living with HIV/AIDS.

The importance of community-based health systems is also supported by research from Kredo et al. (2013), which demonstrated that integrating community health services with formal healthcare systems improves the uptake of HIV services and patient outcomes. This integration ensures that healthcare delivery is more accessible, culturally appropriate, and responsive to the needs of the community.In summary, the significant positive correlation between access to treatment and community-based health systems in this study is consistent with a body of evidence underscoring the effectiveness of community-based approaches in enhancing healthcare access and outcomes for people living with HIV/AIDS. These systems not only facilitate treatment access but also provide ongoing support and education, thereby improving adherence and overall health outcomes. Strengthening community-based health systems can thus be a pivotal strategy in addressing the healthcare needs of teenagers living with HIV/AIDS in the island communities of Lake Victoria and similar settings.

Regression Analysis

This study applied a regression model to identify the effect of community-based health systems and impact on access to treatment by teenagers living with HIV. Regression analysis was conducted to determine the proportion of access to treatment (dependent variable) which could be predicted by community-based health systems (independent variable). It was hypothesized that:

H_{a4}: There is significant relationship between community-based health systems and treatment access by teenagers living with HIV from island communities of Lake Victoria

To test this hypothesis, the model $Y= \beta_0 + \beta_4 X_4 + \varepsilon$ was fitted. Where Y is treatment access by teenagers living with HIV from island communities of Lake Victoria X_4 is community-based health systems.

Regression model summary results in Table 4.31 provides insights into the relationship between community-based health systems and access to treatment among teenagers living with HIV/AIDS in island communities of Lake Victoria. The coefficient of determination (R Square) is 0.216, indicating that approximately 21.6% of the variance in access to treatment can be explained by community-based health systems. The adjusted R Square, which considers the number of predictors in the model, is 0.207. This adjusted value suggests that about 20.7% of the variance in access to treatment remains explained after accounting for the number of predictors. The standard error of the estimate is 3.9876, indicating the average discrepancy between the actual access to treatment values and the predicted values by the model. Overall, these findings suggest that community-based health systems explain a significant portion of the variance in access to treatment among teenagers living with HIV/AIDS in the studied communities. Strengthening and optimizing these health systems could contribute to improved access to treatment and better health outcomes for this population.

Table 4.31: Model Summary (Community Based Health Systems and Access to Treatment)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.465a	.216	.207	3.9876

a. Predictors: (Constant), Community Based Health Systems

The ANOVA statistics presented in Table 4.32 examine the significance of the regression model for predicting treatment access based on community-based health systems among teenagers living with HIV/AIDS. The regression sum of squares (SS) is 78.425, indicating the variability in treatment access explained by the model. With 1 degree of freedom (df) for the regression and 136 df for the residual (error), the mean square for the regression (78.425) is compared to the mean square for the residual (2.093) to compute the F-statistic. The F-statistic, which is 37.470, is significant at $p < 0.0001$ (as denoted by the Sig. value). This suggests that the regression model as a whole significantly predicts treatment access. These results imply that community-based health systems play a crucial role in determining access to treatment for teenagers living with HIV/AIDS in the studied communities. Strengthening these systems through enhanced community engagement, infrastructure development, and resource allocation could lead to improved access to treatment and better health outcomes for this vulnerable population.

Table 4.32: ANOVA Statistics (Community Based Health Systems and Treatment Access)

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	78.425	1	78.425	37.470	.000[b]
	Residual	284.655	136	2.093		
	Total	363.080	137			

a. Dependent Variable: Access to Treatment
b. Predictors: (Constant), Community based health systems

The regression coefficients presented in Table 4.33 represent the relationship between community-based health systems and treatment access among teenagers living with

HIV/AIDS. The coefficient for community-based health systems is 0.408, indicating that for every one-unit increase in the community-based health systems variable, treatment access increases by 0.408 units, holding all other variables constant. The equation representing this relationship is:

Treatment Access = 3.908 + (0.408 * Community Based Health Systems)

This equation suggests that community-based health systems have a positive impact on treatment access. As the level of community-based health systems increases, there is a corresponding increase in treatment access for teenagers living with HIV/AIDS in island communities of Lake Victoria. These findings underscore the importance of community-based approaches in facilitating access to treatment for HIV/AIDS among teenagers. Strengthening community-based health systems, including outreach programs, community health workers, and local healthcare infrastructure, can contribute significantly to improving treatment access and health outcomes in these communities.

Table 4.33: Regression Coefficients (Community Based Health Systems and Treatment Access

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	3.908	.909		4.299	.000
	Community based health systems	.408	.180	.216	2.266	.000

a. Dependent Variable: Treatment access by teenagers living with HIV from island communities of Lake Victoria.

The finding from Table 4.30, indicating a significant positive correlation between access to treatment and community-based health systems among teenagers living with HIV/AIDS in the island communities of Lake Victoria, is well-supported by existing literature. Previous studies have consistently highlighted the critical role of community-based health systems in improving healthcare access and outcomes for vulnerable populations, particularly in resource-limited settings.

Mwai et al. (2013) conducted a systematic review that underscored the pivotal role of CHWs in enhancing linkage to care and adherence to antiretroviral therapy (ART) among people living with HIV/AIDS. The review found that CHWs significantly improve health outcomes by providing continuous support, education, and follow-up care. This aligns with the current findings, suggesting that effective community-based health systems facilitate better access to treatment for teenagers living with HIV/AIDS. Wouters et al. (2012) demonstrated that peer support groups and community networks are instrumental in improving adherence to HIV treatment. Their study showed that peer support helps address social barriers such as stigma and discrimination, which are significant issues for teenagers living with HIV. This finding supports the positive correlation observed in the current study between community-based health systems and treatment access.

Kredo et al. (2013) emphasized the importance of integrating community health services with formal healthcare systems to enhance the uptake of HIV services and improve patient outcomes. This integration ensures that healthcare delivery is accessible and culturally appropriate, which is crucial for the successful treatment of HIV in diverse communities. The current study's findings resonate with this approach, indicating that strong community-based health systems are linked to better treatment access. Nglazi et al. (2012) highlighted the effectiveness of home-based care interventions in improving ART adherence and retention in care. Their study found that home-based care, provided by community health workers and supported by community networks, significantly enhances the accessibility and continuity of care for people living with HIV. This supports the current study's conclusion that community-based health systems positively impact treatment access for teenagers living with HIV.

Research by Chib et al. (2012) found that community-based health interventions that are culturally and contextually relevant are more effective in reaching marginalized populations. This is particularly important for teenagers living with HIV in island communities, where tailored interventions can address specific local challenges and needs. The current study's findings align with this perspective, suggesting that

community-based health systems that consider local context are crucial for improving treatment access. In summary, the positive correlation between access to treatment and community-based health systems observed in the current study is corroborated by extensive previous research. These studies consistently demonstrate that community-based health systems play a vital role in enhancing healthcare access, adherence to treatment, and overall health outcomes for people living with HIV/AIDS. Strengthening these systems can significantly improve the treatment access and health outcomes for teenagers living with HIV in island communities.

4.11 Multiple Regression Analysis

The model summary presented in Table 4.24 indicates that the combined effect of the predictors—Characterization of mHealth Users, Knowledge Management, Technology Obsolescence, and Community Based Health Systems—accounts for a substantial proportion of the variance in treatment access among teenagers living with HIV/AIDS in island communities of Lake Victoria. The coefficient of determination (R Square) is 0.769, suggesting that approximately 76.9% of the variability in treatment access can be explained by the combination of these predictors. The adjusted R Square, which considers the number of predictors in the model, is 0.746. This adjusted value indicates that around 74.6% of the variability in treatment access is explained by the predictors, adjusted for the number of predictors in the model. These results suggest that the combination of factors related to mHealth utilization, knowledge management, technology obsolescence, and community-based health systems has a significant influence on treatment access for teenagers living with HIV/AIDS in island communities. It underscores the importance of considering multiple factors and implementing comprehensive interventions to improve treatment access and health outcomes in these populations. By addressing various aspects of mHealth utilization and healthcare systems at both individual and community levels, policymakers and healthcare providers can better tailor interventions to meet the specific needs of teenagers living with HIV/AIDS in these settings.

Table 4.34: Model Summary (Combined Effect)

R	R Square	Adjusted R Square	Std. Error of the Estimate
.877	.769	.746	.87655

a. Predictors: (Constant), Characterization of mHealth Users, Knowledge management, Technology Obsolescence, Community Based Health Systems

The ANOVA results in Table 4.35 indicate a significant combined effect of the predictors—characterization of mHealth Users, Knowledge Management, Technology Obsolescence, and Community-Based Health Systems—on treatment access among teenagers living with HIV in island communities of Lake Victoria. The regression model demonstrates a high degree of statistical significance, with an F-statistic of 97.711 ($p < 0.001$), suggesting that the predictors collectively have a substantial impact on treatment access. The substantial sum of squares for regression (270.858) relative to the sum of squares for the residual (92.230) indicates that the predictors account for a significant proportion of the variability in treatment access among the study population. This suggests that factors related to mHealth utilization, knowledge management, technology obsolescence, and community-based health systems play crucial roles in determining teenagers' access to HIV treatment in island communities.

These findings underscore the importance of considering a multifaceted approach to improving treatment access for teenagers living with HIV/AIDS. Interventions should focus not only on enhancing mHealth utilization but also on addressing broader issues such as knowledge dissemination, technological infrastructure, and community-based support systems. By addressing these factors comprehensively, healthcare interventions can effectively improve treatment access and overall health outcomes for teenagers living with HIV in island communities.

Table 4.35: ANOVA[a] Statistics (Combined Effect)

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	270.858	4	67.714	97.711	.000[b]
	Residual	92.230	133	.693		
	Total	**363.080**	**137**			

a. Dependent Variable: Treatment access by teenagers living with HIV from island communities of Lake Victoria

b. Predictors: (Constant), characterization of mHealth Users, Knowledge management, technology obsolescence, community-based health systems

Further, the study ran the procedure of obtaining the regression coefficients, and the results were as shown on the Table 4.36 below. The coefficients or beta weights for each variable allows the researcher to compare the relative importance of each independent variable. In this study the unstandardized coefficients and standardized coefficients are given for the multiple regression equations. However, discussions are based on the unstandardized coefficients.

Table 4.36: Regression Coefficient Results (Combined Effect)

Model		Unstandardized Coefficients		Standardized Coefficients	T	P-value.
		B	Std. Error	B		
1	(Constant)	8.765	.987		8.880	.000
	Characterization of mHealth Users	.613	.199	.456	3.080	.003
	Knowledge Management	.767	.208	.643	3.687	.000
	Technology obsolescence	.736	.211	.602	3.348	.002
	Community based health systems	.543	.267	.406	2.034	.004

The Multiple regression model equation would be ($\mathbf{Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon}$) becomes: $Y= 8.765+ 0.613X_1+ 0.767X_2 + 0.736X_3 + 0.543X_4$. This indicates that treatment access by teenagers living with HIV from island communities of Lake Victoria = 8.765 + 0.613 (Characterization of mHealth Users) + 0.767 (Knowledge Management) + 0.767 (Technology obsolescence) + 0.543 (Community based health systems).

According to the regression equation established, taking all factors into account Characterization of mHealth Users, Knowledge Management, Technology obsolescence, Community based health systems) constant at zero, Treatment access by teenagers living with HIV from island communities of Lake Victoria was 8.765.

Findings in Table 4.37 below showed that ccharacterization of mHealth users had coefficients of estimate which was significant basing on $\beta_1 = 0.613$ (p-value = 0.003 which is less than $\alpha = 0.05$). Also, the effect of ccharacterization of mHealth users is more than the effect attributed to the error and supported by the t values whereby t cal= 3.080 > t critical =1.96 at a 5 percent level of significance, thus we conclude that there is a significant relationship between ccharacterization of mHealth users and treatment access by teenagers living with HIV from island communities of Lake Victoria. This suggests that understanding the characteristics and preferences of mHealth users can be instrumental in enhancing treatment accessibility for teenagers living with HIV/AIDS.

Several studies have emphasized the significance of understanding user characteristics and preferences in designing effective mHealth interventions. For example, a study by Muessig et al. (2013) found that tailoring mHealth interventions to suit the needs and preferences of adolescents living with HIV led to increased engagement and adherence to treatment. Similarly, a systematic review by Lee et al. (2014) highlighted the importance of user-centered design in mHealth interventions for HIV/AIDS management, emphasizing the need to consider factors such as literacy levels, language preferences, and technological proficiency.

In addition, the findings in Table 4.37 below indicates that knowledge management had coefficients of estimate which was significant basing on $\beta_1 = 0.767$ (p-value = 0.000 which is less than $\alpha = 0.05$). Also, the effect of knowledge management is more than the effect attributed to the error and supported by the t values whereby t cal= 3.687 > t critical =1.96 at a 5 percent level of significance, thus we conclude that there is a significant relationship between knowledge management and treatment access by teenagers living with HIV from island communities of Lake Victoria. Effective

management of HIV-related knowledge, including dissemination and utilization, is crucial for improving access to treatment among teenagers in these communities.

The role of knowledge management in HIV/AIDS treatment and care has also been well-documented in previous literature. Studies have shown that interventions aimed at improving knowledge about HIV prevention, testing, and treatment options can positively impact treatment-seeking behavior and adherence to antiretroviral therapy (ART) among adolescents. For instance, a study by Saberi et al. (2017) demonstrated that educational interventions delivered via mobile technology significantly improved knowledge and self-efficacy related to HIV care and treatment among adolescents living with HIV.

Further, the findings in Table 4.37 below indicates that technology obsolescence had coefficients of estimate which was significant basing on $\beta_1 = 0.736$ (p-value = 0.002 which is less than $\alpha = 0.05$). Also, the effect of technology obsolescence is more than the effect attributed to the error and supported by the t values whereby t cal= 3.348 > t critical =1.96 at a 5 percent level of significance, thus we conclude that there is a significant relationship between technology obsolescence and ttreatment access by teenagers living with HIV from island communities of Lake Victoria. Addressing issues related to outdated technology and ensuring access to modern healthcare infrastructure can significantly enhance treatment accessibility for teenagers living with HIV/AIDS.

Moreover, research has highlighted the importance of addressing technology obsolescence and infrastructure challenges in healthcare access, particularly in resource-constrained settings. Studies have underscored the need for investment in digital health infrastructure and the adoption of modern technologies to overcome barriers to healthcare access and delivery. For example, a study by Labrique et al. (2013) emphasized the potential of mobile technologies to bridge gaps in healthcare delivery and improve access to HIV/AIDS services in low-resource settings.

The findings in Table 4.37 below indicates that community-based health systems had coefficients of estimate which was significant basing on $\beta_1 = 0.543$(p-value = 0.004

which is less than $\alpha = 0.05$). Also, the effect of community-based health systems is more than the effect attributed to the error and supported by the t values whereby t cal= 2.034 > t critical =1.96 at a 5 percent level of significance, thus we conclude that there is a significant relationship between community-based health systems and treatment access by teenagers living with HIV from island communities of Lake Victoria. The study thus concluded that there is a positive and significant relationship between community-based health systems and treatment access by teenagers living with HIV from island communities of Lake Victoria. Strengthening community-based healthcare services and support systems can play a pivotal role in improving treatment access and overall health outcomes for teenagers in island communities. Additionally, community-based health systems have been recognized as key drivers of healthcare access and utilization, particularly among marginalized populations. Previous research has shown that community-based interventions, such as peer support groups, community health worker programs, and outreach initiatives, play a crucial role in improving treatment adherence and retention in care among adolescents living with HIV. For instance, a study by Govindasamy et al. (2014) found that community-based interventions led to significant improvements in treatment outcomes among adolescents living with HIV in sub-Saharan Africa.

Overall, these findings emphasize the importance of addressing multifaceted factors—including user characteristics, knowledge management, technological infrastructure, and community-based healthcare systems—to enhance treatment access for teenagers living with HIV in island communities. By focusing on these areas, healthcare interventions can effectively bridge gaps in treatment access and improve health outcomes for this vulnerable population. In summary, the findings of this study are supported by previous research, which underscores the importance of user-centered design, knowledge management, technology infrastructure, and community-based healthcare systems in enhancing treatment access and improving health outcomes for adolescents living with HIV.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter comprises of four main sections that were guided by the specific objectives and research questions on the effect of mHealth utilization on access to treatment by teenagers living with HIV/AIDS in island communities of Lake Victoria. The first section is the study summary on the impact of mHealth utilization, knowledge management, technology obsolescence, and community-based health support systems on treatment access for HIV-positive teenagers in Lake Victoria Island Communities, focusing on the extent to which these factors contribute to sustainable access. This section also provides insight through conclusions and recommendations for policy, recommendations for access to treatment by teenagers living with HIV/AIDS in island communities of Lake Victoria and suggestions for further research.

5.2 Summary of the Findings

From the theoretical and empirical literature reviewed, it was revealed that mHealth utilization improve access to treatment – with significant relationship between characterization of mHealth users, knowledge management, technology obsolescence, and community-based health systems. The purpose of this study was to examine the effect of mHealth utilization on access to treatment by teenagers living with HIV/AIDS in island communities of Lake Victoria. The study was guided by the following specific objectives: Characterize mHealth utilization by teenagers living with HIV from island communities of Lake Victoria and its effect on treatment access; Establish the knowledge management of mHealth information by teenagers living with HIV from the island communities of Lake Victoria and its effect on access to treatment; Determine technology obsolescence on the utilization of mHealth information by teenagers living with HIV from the island communities of Lake Victoria and its effect on treatment

access; and Explore community-based health support systems that facilitate suitable utilization of mHealth by teenagers living with HIV from the island communities of Lake Victoria and its effect on treatment access. The specific findings relating to the study objectives and research questions are summarized in the following section.

5.2.1 What Characterizes mHealth Utilization that Affect Treatment Access by Teenagers Living with HIV from Island Communities of Lake Victoria?

From descriptive statistics, it was established that teenager boys used mHealth utilization to access treatment than girls. It was also found out that in regard to household status, majority of the teenagers living with HIV from Island communities of Lake Victoria were single parent (majorly mother). The teenagers living with HIV from Island Communities of Lake Victoria acquired and first diagnosed as HIV positive after suffering from other ailments and when the general diagnosis was carried out, they found out that they were infected. Majority of the teenagers stated that they started treatment immediately after being diagnosed and have not changed their drug regimen.

The study found that teenagers with HIV/AIDS either own or have access mobile phone. As per the study, most teenagers own non smart phones which lack the touch screen interfaces and operating systems for downloaded applications. Most teenagers access mobile phones about two times a day. The study as revealed that most of the teenagers access HIV information on mobile phone with a caregiver. The study found that most teenagers buy airtime for mobile phones, with parents being the primary buyers. Also, majority of teenagers use internet bundles, with most spending 6-15 minutes accessing HIV information. The study revealed that teenagers in Mfangano, Takawiri, Ringiti, and Remba Islands, engaging their peers through mHealth activities via Facebook, WhatsApp., and SMS Platform.

The study established that the teenagers look for information on matters of HIV especially on the risk reduction in terms of probing the areas: reducing sexual exposures, pre-exposure prophylaxis, blood transfusion, drugs and substance abuse, HIV

testing(probe areas: HIV test locations, HIV testing frequency, Confidential & Anonymous), Immune System(probe areas: HIV Lifecycle, Stages of HIV Infection, Physical Changes), Understanding test results (probe areas: Types of Lab Tests, CD4 Count, Viral Load, Drug resistance), Treatment options (probe areas: Reasons to Start Treatment, Side Effects, Medication Adherence, Drug Resistance) and Disclosure (probe areas: Family level, Sexual Friend). The study established that information mostly shared in mHealth was on HIV treatment and new programs in HIV management by government. The study also established that they look for information from health facilities available, parents/ caregiver, friends, siblings, teachers and religious leaders. Further, regarding the question on the reasons for the teenagers living with HIV from Island Communities of Lake Victoria failure to use mHealth to access treatment, it was established that out of project coverage, access a mobile phone, fear of stigma and discrimination due to disclose to those with mobile phones and teenagers do not see value addition for treatment access and poor network coverage as key reasons hindering them to access the treatment.

5.2.2 To What Extent Does Knowledge Management Affect Access to mHealth Information for Treatment by Teenagers Living with HIV from the Island Communities of Lake Victoria?

From the descriptive statistics, it was established that majority of the teenagers living with HIV from the Island communities of Lake Victoria receive mHealth inform in the format of text, pictorial, video and audio. They also stated that they receive information any time of the day prior to the day of appointment to prepare them to access treatment. The main reasons given for the choosing of the time was due to availability of mobile phone, privacy and correspondence being instantaneous. The teenagers preferred pictorial and audio format to receive information since it demonstrated steps of doing something, provided basic information on HIV health service and benefits; engaged with source of information. The teenagers also indicated that they kept/stored information accessed on HIV in their phones memory and cloud-based systems. The main reason for preference of storage of information was due to bulkiness of information, privacy and

information security, fear of stigma and discrimination. They also kept information for a short period and deleted it.

The study established that the main purpose of seeking the above information was get to advised by their care and treatment clinician, the friends were looking out for that kind of information, they were aware of their situation and would like to know more, their guardian / parents discussed with them around those topics, the friends who needed information on those topics, they feared that they might face some situations, thus they needed to know more about the topics. They also stated that they had a personal behaviour change goal in the said areas so looking out for information that could help them. The study also established that they utilized the above information from the three areas sought on mHealth since they practiced new ways of living, educated their peers on the same and used it to influence their decision on matters concerning their lives. The teenagers some searches, which HIV information they thought should be beefed up on mHealth and included about HIV transmission, HIV treatment, new programs in HIV management by government, research on HIV, dealing with stigma and discrimination, legal issues around HIV and community activities on HIV. The teenagers indicated that they forwarded information using mobile phone, in group counseling discussion during support group sessions and at community functions, workshops on HIV. They used social media (Facebook, WhatsApp, YouTube, Instagram, Google, LinkedIn, Telegram, Twitter) and to a small extent non-governmental organizations specific mobile Apps.

5.2.3 To What Extent Does Technology Obsolescence Affect Access to MHealth Information for Treatment Among Teenagers Living with HIV from Island Communities of Lake Victoria?

From the descriptive statistics, it was established that teenagers living with HIV from island communities of Lake Victoria used phones to access treatment. The phones were used since they could get new information on the subjects, used language (including slung and symbols) that they use as a teenager, message was simple to understand without medical vocabulary, it was from sources they knew and acknowledged as

credible. They used phones since they come in a multimedia format (audio and video) making it interesting to listen and go through. The teenagers indicated that they preferred various platform (sites/Apps) such as social media (Specify from the following list: Facebook, WhatsApp, YouTube, Instagram, Google, LinkedIn, Telegram, Twitter), NGO Specific Mobile App (Specify from the following list: E and M Platform facilitated by K-MET, Youth ASK SMS Project to facilitate by ADS Nyanza, GUSO facilitated by SR Alliance, mTIBA). The study established that the teenagers frequently did change their phones to enable them to be techno savvy to access treatment when required. The study also found out that the reasons for changing mobile phone included the wiped off the market so they had to buy another type, their friends bought new ones so they also went for the same make as their friends, their phones had problems with memory, their phone had problems with battery power and Some Apps could be downloaded in their old phones. It was established that mHealth information packaged in line with how they communicated to their peers via mobile phones.

5.2.4 To What Extent Does Community-Based Health Support Systems Facilitate Sustainable Access to MHealth Information for Treatment by Teenagers Living with HIV from the Island Communities of Lake Victoria?

The study sought to find out the extent the Community-Based Health Support Systems facilitate sustainable access to mHealth information for treatment by teenagers living with HIV from the Island Communities of Lake Victoria. The study established that to some extent they were involved in selecting mHealth HIV message package, developing prototype of mHealth HIV message, pre-testing of mHealth HIV message prototype and process monitoring of utilization of mHealth HIV message package. From the study findings, it was established that teenagers were involved in social marketing of mHealth apps to facilitate them to access treatment. This was carried out by the identification of influencers (publics – like teachers, health workers, guardians, religious leaders) of teenagers living with HIV and how mHealth could engage them; identification of partners (like schools, churches, community units with similar goals and how to engage them); identifying policies (required for maximization of mHealth message package to

enable reduce barriers); and review of competing needs and opportunity cost in access and utilizing mHealth packages.

On matters relating to community entry teenagers living with HIV From the Island Communities of Lake Victoria were to some extent involved on identification of objectives &evaluation criteria for mHealth indicators; conducting livelihoods analysis on teenagers living with HIV, education of teenagers on mHealth access and utilization, mapping of community linkages for teenagers on mHealth. The study also established that funding of mHealth utilized by the teenager included the church, health facilities, non-governmental organization (NGO), Community based organization (CBO), businesspersons and individuals. It was found out that that church, non-governmental organization (NGO) and Community based organization (CBO) were better placed to fund sustainable mHealth. This is because they were easily able to sustain funding, community-based resourcing, getting donor support and long service history in the community.

From the study results it was established that teenagers were given incentive(s) by organizations to access their mHealth App. This was through airtime, mobile phones, points for accessing the Apps / sites, exchange tours and to some extent Certificate of appreciation. The teenagers were ever used an App (site) that prompts referral for medical attention and these referrals prompted for included seeking counseling on HIV issues, testing of HIV, treatment of opportunistic infections, contraceptive matters and sexual assault. Further, the teenagers facilitated the process through which the services referred to were available in their island, distance to health facility was not an issue, health care workers were receptive, there was an operational teenage friendly center at the facility and referrals prompted were things they could get medical assistance at community level.

It was established that the referral process was easy to make appointments needed one to make appointment available within a reasonable amount of time and keeping you reminded about their appointment. The referrals most appreciated if placed via mHealth

Apps included seeking counseling on HIV issues, testing of HIV, treatment of opportunistic infections, contraceptive matters, and sexual assault. Further, due to mHealth, teenager most achieved under care and treatment included timely treatment because of communicating with the health facility, responsive to appointment dates prompted by my phone, cross checking information related to their treatment online, reported any anomalies (possibly skip of drugs due to ailments or away from home) and connected with their friends for any treatment updates (talks, drugs) communicated to them. They engaged in safe sex as communicated by various HIV information sites as a tool for prevention with positives. The teenagers used the mobile phone to prompt appointments on drug picking, psychosocial support group meeting and drug taking. The methods they did use commonly included mobile phone alarm with dates, get calls from the health facility, get calls from their treatment buddy and pre-set SMS to send to self.

5.3 Conclusion

The study examined the characterize mHealth utilization by teenagers living with HIV from island communities of Lake Victoria and its effect on treatment access. Based on the inferential analysis findings, it can be concluded that characterize mHealth utilization by teenagers positively and significantly affected access to treatment by teenagers living with HIV/AIDS in island communities of Lake Victoria. The study findings are in line with the findings by Deloitte (2012) state that characterize mHealth utilization by teenagers and provided opportunities to develop mHealth solutions to improve health care. Characterization of mHealth determine the services, such as, simple text messaging to improve treatment compliance and applications for diagnostic and treatment support, and complex system infrastructures that enable remote monitoring and audio-visual communication for real time interaction between patients and providers that are available.

The study investigated knowledge management of mHealth information by teenagers living with HIV from the island communities of Lake Victoria and its effect on access to treatment. From the inferential analysis, the results indicates that that knowledge

management of mHealth information by teenagers living with HIV positively and significantly affected access to treatment by teenagers living with HIV/AIDS in island communities of Lake Victoria. The study findings are in line with the findings by Edem and Ani (2010) observed that knowledge has become the driving force for social development, the attention of the society to information and knowledge is rising and people's demands for information and knowledge is increasing step by step Teenagers, recognized as a critical intervention cohort, makes it is pertinent to understand how they get informed via mHealth for decision making on matters HIV and AIDS.

The study sought to determine technology obsolescence on the utilization of mHealth information by teenagers living with HIV from the island communities of Lake Victoria and its effect on treatment access. From the inferential analysis, the study concludes that technology obsolescence significantly affected access to treatment by teenagers living with HIV/AIDS in island communities of Lake Victoria. The study results are in tandem with the findings by Gartner (2016) found out that beside the mHealth market offering the desired possibilities of: data collection (where mobile devices replace and/or complement traditional paper-based tools); and behavior change, (where mobile devices are used to disseminate key messages and good practices among communities in Africa), there are direct contribution to the global access to medical support.

The study sought to explore community-based health support systems that facilitate suitable utilization of mHealth by teenagers living with HIV from the island communities of Lake Victoria and its effect on treatment access. From the inferential analysis, the study concludes that community-based health support systems positively and significantly affected access to treatment by teenagers living with HIV/AIDS in island communities of Lake Victoria. The study results are in line with the findings by Makaoae (2005) found out that discourse on sustainability of community-based HIV/AIDS projects in SSA, is because the epidemic has affected the family as a functioning system, threatened its supportive capacity, and redefined the manner of coping and adapting mechanisms. Coping with HIV infection requires community support with disclosure of status to support groups results in greater social and emotional

support. It is therefore suggested that a process by which citizens act in response to public concerns, voice their opinions about decisions that affect them, and take responsibility for changes to their community should be initiated, hence defining participatory approach.

5.4 Recommendations

To enhance the characterization of mHealth utilization among teenagers living with HIV in the island communities of Lake Victoria, it is crucial to conduct comprehensive needs assessments to understand their specific preferences, challenges, and behaviors regarding mobile health technology. Tailoring mHealth interventions to align with the teenagers' preferred formats, such as text, audio, and video, is essential. Additionally, incorporating interactive and engaging features, such as gamification and social support networks, can increase the appeal and effectiveness of mHealth platforms. Training healthcare providers on the effective use of mHealth tools and encouraging their active involvement in promoting these tools can further improve uptake and adherence to treatment. Continuous feedback mechanisms should be established to monitor user experiences and adapt the interventions to meet evolving needs.

Effective knowledge management is vital to ensure that accurate, relevant, and up-to-date information is accessible to teenagers living with HIV. Developing centralized digital repositories that house educational resources, treatment guidelines, and support services can facilitate easy access to critical information. These repositories should be regularly updated with the latest research findings and best practices in HIV management. Additionally, implementing artificial intelligence-driven chatbots and virtual assistants can provide personalized information and support to users in real time. Encouraging peer education and support networks can also enhance knowledge sharing and create a sense of community among teenagers. Integrating these knowledge management systems with existing healthcare infrastructure will ensure a seamless flow of information between healthcare providers and patients.

Addressing technology obsolescence is essential to ensure that mHealth interventions remain accessible and effective. Providing affordable and up-to-date mobile devices to teenagers living with HIV can mitigate the barriers posed by outdated technology. Establishing partnerships with mobile phone manufacturers and telecommunications companies can facilitate the provision of subsidized or donated smartphones and data plans. Additionally, developing lightweight and compatible mHealth applications that can function on older devices can extend the usability of existing technology. Regularly updating mHealth applications to ensure compatibility with new operating systems and technological advancements is also crucial. Educating teenagers on proper device maintenance and the benefits of upgrading technology can further alleviate the challenges of technology obsolescence.

Strengthening community-based health support systems is critical for the successful utilization of mHealth by teenagers living with HIV. Engaging local communities in the design and implementation of mHealth interventions ensures that these solutions are culturally appropriate and widely accepted. Training community health workers and peer educators to support mHealth initiatives can enhance outreach and provide personalized assistance to teenagers. Establishing support groups and community hubs where teenagers can access digital resources, receive counseling, and participate in educational workshops can foster a supportive environment. Additionally, leveraging existing community structures, such as schools and religious organizations, to disseminate information and promote mHealth can increase reach and impact. Ensuring that these community-based support systems are well-integrated with formal healthcare services will facilitate comprehensive and coordinated care for teenagers living with HIV.

The combined effect of enhancing mHealth utilization, robust knowledge management, addressing technology obsolescence, and strengthening community-based health support systems can significantly improve treatment access for teenagers living with HIV in the island communities of Lake Victoria. By making mHealth interventions more user-friendly, informative, and accessible, teenagers are more likely to engage with these tools, adhere to their treatment regimens, and seek timely medical assistance. Improved

access to accurate information and support networks can empower teenagers to make informed decisions about their health and overcome barriers to treatment. Consequently, these efforts can lead to better health outcomes, reduced transmission rates, and an overall improvement in the quality of life for teenagers living with HIV in these communities.

5.4.1 Policy Implications

Governments should prioritize the integration of mHealth solutions into national HIV/AIDS programs. Policies that support the widespread adoption of mHealth technologies can ensure that these tools are available and accessible to all teenagers living with HIV. This integration can be achieved by allocating funding for mHealth initiatives, developing national standards for mHealth applications, and ensuring interoperability with existing healthcare systems. Moreover, regulatory frameworks should be established to govern the use of mHealth, protecting patient privacy and ensuring the security of health data.

To address the issue of technology obsolescence, policymakers should invest in technological infrastructure and initiatives that provide teenagers with access to up-to-date mobile devices and reliable internet connectivity. This could include subsidies for smartphones and data plans, especially for disadvantaged communities, and the development of public Wi-Fi hotspots in remote areas. Policies encouraging partnerships between the government, private sector, and non-governmental organizations can facilitate the provision of these resources.

Policies should support education and training programs for both healthcare providers and teenagers on the effective use of mHealth tools. For healthcare providers, training should focus on integrating mHealth into clinical practice, ensuring they are equipped to guide and support patients in using these technologies. For teenagers, educational initiatives should emphasize digital literacy, empowering them to utilize mHealth tools

effectively and safely. These programs can be incorporated into school curricula and community outreach efforts.

Policymakers should promote community engagement in the development and implementation of mHealth interventions. Policies that support the involvement of community leaders, local organizations, and peer groups in mHealth initiatives can ensure that these solutions are culturally relevant and widely accepted. Additionally, establishing community-based support systems that integrate mHealth with traditional healthcare services can enhance the overall support network for teenagers living with HIV. Funding and resources should be allocated to train community health workers and peer educators who can facilitate the use of mHealth tools.

Governments should establish and maintain centralized digital repositories that provide accurate and up-to-date information on HIV treatment and management. Policies should support the development of these repositories and ensure they are accessible to all healthcare providers and patients. Furthermore, incentivizing the continuous updating of these repositories with the latest research and best practices can enhance their value. Policymakers should also encourage the development of AI-driven support systems that can provide personalized information and assistance to teenagers living with HIV.

Privacy and security are critical concerns in the use of mHealth. Policymakers should enact stringent data protection laws that safeguard the personal and health information of users. This includes establishing clear guidelines on data collection, storage, and sharing practices. Ensuring that mHealth applications comply with these regulations can build trust among users and encourage wider adoption of these technologies. Additionally, policies should promote transparency in how data is used and provide users with control over their information.

Continuous research and evaluation are essential to assess the effectiveness of mHealth interventions and identify areas for improvement. Policymakers should support funding for research initiatives that evaluate the impact of mHealth on treatment access and health outcomes for teenagers living with HIV. Policies should encourage collaboration between academic institutions, healthcare providers, and technology developers to conduct these studies. Regular monitoring and evaluation can inform policy adjustments and ensure that mHealth interventions remain relevant and effective. By addressing these policy implications, governments and stakeholders can create an enabling environment for the effective utilization of mHealth technologies. This, in turn, can improve treatment access and health outcomes for teenagers living with HIV in the island communities of Lake Victoria and beyond.

5.4.2 Theoretical Implications

The "Effect of mHealth Utilization on Access to Treatment by Teenagers Living with HIV/AIDS in Island Communities of Lake Victoria" study contributes to the existing theories in development studies by emphasizing the role of mobile health (mHealth) technology in addressing healthcare access challenges, particularly among marginalized populations such as teenagers living with HIV/AIDS in island communities. Here's how it aligns wit existing theories:

Technology Adoption Theories: The study aligns with theories of technology adoption, such as the Technology Acceptance Model (TAM) and the Diffusion of Innovations theory. These theories suggest that individuals are more likely to adopt new technologies if they perceive them to be useful and easy to use. By examining the impact of mHealth utilization on treatment access, the study provides empirical evidence supporting the adoption and integration of mHealth technologies into healthcare delivery systems to improve access to treatment for vulnerable populations.

Community-Based Approaches: The study underscores the importance of community-based approaches in healthcare delivery, which resonates with theories emphasizing

community empowerment and participation in development processes. By focusing on island communities of Lake Victoria, the study highlights the significance of engaging local communities in healthcare interventions and tailoring mHealth solutions to meet their specific needs and contexts.

Health Behavior Change Theories: The study aligns with health behavior change theories, such as the Health Belief Model and the Social Cognitive Theory, which emphasize the role of individual beliefs, attitudes, and social influences in shaping health-related behaviors. By exploring the relationship between mHealth utilization and treatment access, the study contributes to our understanding of how technology can influence health behaviors and outcomes among adolescents living with HIV/AIDS.

Development Communication Theories: The study also relates to theories of development communication, which emphasize the role of communication technologies in promoting social change and development. By examining the communication dynamics facilitated by mHealth interventions, the study contributes to our understanding of how communication technologies can be leveraged to address health disparities and improve access to healthcare services in resource-constrained settings.

Overall, the "Effect of mHealth Utilization on Access to Treatment by Teenagers Living with HIV/AIDS in Island Communities of Lake Victoria" study adds to the body of knowledge in development studies by providing insights into the potential of mHealth technologies to enhance healthcare access and improve health outcomes among vulnerable populations, thereby advancing theories related to technology adoption, community-based approaches, health behavior change, and development communication.

5.4.3 Contribution of Existing Body of Knowledge

The study on the "Effect of mHealth Utilization on Access to Treatment by Teenagers Living with HIV/AIDS in Island Communities of Lake Victoria" represents a significant

contribution to the existing body of knowledge in several key ways. Firstly, through its empirical research, the study provides tangible evidence on the impact of mHealth interventions on healthcare access among teenagers living with HIV/AIDS. By collecting data from island communities in Lake Victoria, the study offers real-world insights into the effectiveness of mobile technologies in improving treatment access for this vulnerable population.

Secondly, the study enhances our understanding of the unique challenges and opportunities related to healthcare access in island communities. By focusing on a specific geographical context, the research sheds light on the contextual factors that influence treatment accessibility, including geographical isolation, limited healthcare infrastructure, and socio-economic disparities. This contextual understanding is crucial for developing targeted interventions that address the specific needs of teenagers in similar settings.

Moreover, the study contributes to the literature on technology integration in healthcare by examining the role of mHealth solutions in overcoming access barriers. By exploring how mobile phones and digital platforms can be leveraged to deliver healthcare services and support to teenagers with HIV/AIDS, the research highlights the potential of innovative technological solutions to address healthcare disparities in underserved regions.

Furthermore, the findings of the study have important policy implications, providing valuable insights for policymakers and healthcare practitioners. By identifying the effectiveness of mHealth interventions in improving treatment access, the study informs the development of evidence-based policies and programs aimed at expanding access to healthcare services for teenagers living with HIV/AIDS. These insights can help shape healthcare delivery strategies and resource allocation decisions to better meet the needs of this vulnerable population.

Lastly, the study may contribute to theoretical advancements in fields such as public health, development studies, and communication. By examining the mechanisms through which mHealth utilization influences health behavior and outcomes, the research enriches existing theoretical frameworks and models, advancing our understanding of the interplay between technology, healthcare, and social determinants of health. Overall, the study on the "Effect of mHealth Utilization on Access to Treatment by Teenagers Living with HIV/AIDS in Island Communities of Lake Victoria" makes a valuable contribution to both academic scholarship and practical efforts to improve healthcare access and outcomes for vulnerable populations.

5.5 Suggestion for Further Research

The findings of the study, as summarized in the previous section have several implications for theory, methodology and practice. Overall, the findings of the study provide substantial support for the conceptual framework. Specifically, the results demonstrate that mHealth utilization can act as a powerful tool that can directly lead to improved access to treatment viewed as a solution to teenagers living with HIV/AIDS in island communities of Lake Victoria facing a myriad of challenges in regard to access to treatment.

This research study was conducted in island communities of Lake Victoria and hence the findings cannot be generalized to other regions. The study also found that mHealth utilization explained 76.90% of the access to treatment by teenagers living with HIV/AIDS in island communities of Lake Victoria. The study, therefore, suggests further studies on the other factors affecting the access to treatment by teenagers living with HIV/AIDS in island communities of Lake Victoria. The additional model could be explained through the insertion of other moderators like availability of medical supplies and human resource capacity to the hypothesized relationship. With the continuation of research on mHealth utilization, there is a need for researching on the conventionally accepted mHealth utilization for harmonization and improvement on the overall access to treatment by teenagers living with HIV/AIDS. The relationship between mHealth

utilization and access to treatment should also be researched further to improve on the body of knowledge on mHealth and access to treatment especially on HIV/AIDS related ailments.

There is need for longitudinal Impact of mHealth Interventions as the future studies should focus on the long-term impact of mHealth interventions on treatment adherence, health outcomes, and quality of life among teenagers living with HIV. Longitudinal research can provide insights into how sustained use of mHealth tools influences health behaviors and outcomes over time. This can help determine the enduring benefits and potential challenges associated with mHealth applications. Moreover, comparative studies across different regions require comparative studies that examine the effectiveness of mHealth interventions in different geographical regions and socio-economic contexts can help identify factors that enhance or hinder the success of these programs. Such studies can highlight best practices and contextual challenges, offering guidance for tailoring mHealth solutions to diverse populations. Understanding regional differences can also aid in customizing interventions to meet specific community needs.

Also, there is need for user experience and engagement:, that the research should explore the user experience and engagement levels with various mHealth platforms. Understanding teenagers' preferences, challenges, and satisfaction with different mHealth tools can inform the design and implementation of more user-friendly and effective applications. Insights from user experience studies can lead to the development of interfaces and functionalities that better meet the needs of young users.

In addition, impact of digital literacy programs that require an investigation the impact of digital literacy programs on the adoption and effective use of mHealth tools among teenagers living with HIV. Studies can assess how digital literacy training influences teenagers' confidence, proficiency, and overall engagement with mHealth technologies. Enhancing digital literacy could be key to maximizing the benefits of mHealth interventions. Besides, the integration of mHealth with traditional healthcare systems, the future research should examine the integration of mHealth tools with traditional

healthcare systems and its effect on healthcare delivery and patient outcomes. Studies can evaluate how mHealth complements face-to-face consultations, medication management, and overall healthcare coordination. This can provide a holistic view of how mHealth fits into the broader healthcare landscape.

Furthermore, the effectiveness of privacy and security measures, require an investigation in mHealth applications and their impact on user trust and adoption. Understanding how teenagers perceive and respond to privacy protections can help developers and policymakers enhance data security and build user confidence. Ensuring robust privacy measures is crucial for the success of mHealth initiatives. Further studies should explore the role of community-based support systems in facilitating mHealth utilization. Research can assess how community health workers, peer educators, and local organizations influence the adoption and sustained use of mHealth tools among teenagers. Community involvement can significantly impact the reach and effectiveness of mHealth interventions.

There is need to involve a study on technological Innovations in mHealth. This will require an examination on the impact of emerging technologies, such as artificial intelligence, machine learning, and blockchain, on mHealth applications for HIV management. Studies can explore how these innovations enhance personalization, data security, and overall effectiveness of mHealth interventions. Leveraging advanced technologies could revolutionize mHealth strategies. Lastly, investigate the barriers to mHealth adoption among teenagers living with HIV, including socio-cultural, economic, and technological factors. Understanding these barriers can inform the development of targeted strategies to overcome obstacles and improve mHealth uptake. Addressing these barriers is essential for the widespread success of mHealth tools. By addressing these areas, future research can provide comprehensive insights into the multifaceted aspects of mHealth utilization and its impact on the treatment access and health outcomes of teenagers living with HIV. This knowledge will be crucial for optimizing mHealth strategies and ensuring their effectiveness in diverse contexts.

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APPENDICES

Appendix I: Data Collection Tools

Questionnaire

SECTION A – CONSENT

Introductory Letter Serial No._____

My name is OLAN'G ALFRED PHILIP BILL OKAKA, a doctorate student of Development Studies, in the School of Communication and Development Studies of Jomo Kenyatta University of Agriculture and Technology. This is to inform you (respondent) that the questionnaire being administered is for a study on ***effect of mHealth utilization on access to treatment by teenagers living with HIV/AIDS in island communities of Lake Victoria***, for the fulfillment of the degree. It is hoped that the findings from the study will be used to recommend on factors influencing the same. If this is okay with you and of interest to generate more knowledge in the said areas, the research assistant will read to you this section.

> *"I hereby agree by voluntarily accepting to participate in the study. I understand that all the information that I provide will remain anonymous, and that researcher will not reveal my identity to any outside source without permission from me. I agree that the results of the overall study may be used for program design and research in the future by the researcher. I hereby grant the researcher permission to use my answers as part of their overall sample in their evaluation. The results of this research may be shared with others, but my identity may never be revealed."*

It is also important to note that it is only until you (respondent/the teenager) voluntarily allow to contribute to the study that she shall be engaged there after – this by signing below.

Name of Caretaker: _____ *ID Number:* _____

Date of Signing Consent: _____ *Phone:* _____

Island: _____ *Facility:* _____

Thank you.

SECTION B: SURVEY QUALITY CONTROL

(Fill section in CAPS)

Questionnaire serial number: _____

Name of island: _____

Name of health facility: _____

Name of health care worker: _____

Mobile phone (health care worker): _____

Name of support group: _____

Name of enumerator: _____

Mobile phone (enumerator): _____

Date of interview: _____

Time of interview (start): _____(end): _____

SECTION C – CHARACTERIZATION (to the teenager)

1) Age of teenager (in years) _____

2) Sex of teenager (circle response)
   a. Boy b. Girl

3) Number of years of education taken by teenager (as of time of interview)
   _____

4) Who is the head of your household? (circle one response)
   a. All parents alive
   b. Single parent – Mother
   c. Single parent - Father
   d. Child headed (below 18 years)
   e. Other (specify) _____

5) When were you infected with HIV? (circle response)
   a. At birth
   b. Acquired
   c. Don't know
   d. Other (specify) _____

6) When were you first diagnosed as HIV positive at a medical facility?
   Year_____Month_____

7) When did you start treatment at a medical facility?
   Year_____Month_____

8) Have you ever changed your drug regimen? (circle response)
   a. Yes (go to question 9)
   b. No

9) What is your current treatment regimen?
   a. First
   b. Second
   c. Third

10) Do you own a personal mobile phone?
   a. Yes (jump to question 11)
   b. No

11) If no to question 10, how do you **MAINLY** access a mobile phone? (circle one)
   a. Friend
   b. Siblings
   c. Health care worker
   d. Parents
   e. Caregiver
   f. Other (specify) _____

12) What type of phone do you access? (circle response)
   a. Smartphone *(a cellular phone that performs many of the functions of a computer, typically having a touchscreen interface, internet access, and an operating system capable of running downloaded applications)*
   b. Non-smartphone.

13) How many times do you access the mobile phone in a day? (circle response)

a. Once a day (possibly in the morning or evening)
b. Twice a day (possibly in the morning and evening)
c. Three times a day (possibly morning, afternoon and evening)
d. Occasionally (only when the owner is around)
e. Always (throughout the day)
f. Other (specify) ----------
_____

14) At any time you access a mobile phone for HIV information, how long do you take? (in minutes) you take more than 15 minutes. (circle one response)
a. 5 minutes and below.
b. 6 to 10 minutes.
c. 11 to 15 minutes.
d. 16 to 20 minutes.
e. 21 to 25 minutes.
f. 26 minutes and above.

15) How do you **MOSTLY** access HIV information on mobile phones? (circle response)
a. Alone
b. With a friend
c. In a group
d. With caregiver (father, mother, elder sibling)
e. Other (specify)
_____

16) Who **MOSTLY** buys the airtime for the mobile phone you access? (circle multiple)
a. Self
b. Friend
c. Siblings
d. Health care worker
e. Parents
f. An NGO
g. Other (specify) _____

17) Who **MOSTLY** buys the bundles for the mobile phone you access? (Tick multiple)
a. Self
b. Friend
c. Siblings
d. Health care worker
e. Parents
f. An NGO
g. Other (specify)
_____

18) Which Apps (sites) do you **MAINLY** access for HIV related information?
a. Social media (Specify from the following list: Facebook, WhatsApp, YouTube, Instagram, Google, LinkedIn, Telegram, Twitter)
_____
___
b. NGO Specific Mobile App (Specify from the following list: e and m Platform facilitated by K-

MET, Youth ASK SMS Project facilitated by ADS Nyanza, GUSO facilitated by SRHR Alliance, mTIBA) _____

c. Other (specify) _____ _____ _____

19) For the Apps identified in question 18, when (year) did you start accessing HIV information via them?
    a. Social media: Year: _____
    b. NGO Specific Mobile App: Year_____
    c. Other (specify) _Year:_____

20) What information do you **MOSTLY** look for on matters of HIV? (circle multiple)

a. Risk reduction *(probe areas: reducing sexual exposures, pre-exposure prophylaxis, blood transfusion, drugs and substance abuse)*_____
b. HIV testing *(probe areas: HIV test locations, HIV testing frequency, Confidential & Anonymous)*_____
c. Immune System *(probe areas: HIV Lifecycle, Stages of HIV Infection, Physical Changes)* _____
d. Understanding test results *(probe areas: Types of Lab Tests, CD4 Count, Viral Load, Drug resistance)* _____
e. Treatment options *(probe areas: Reasons to Start Treatment, Side Effects, Medication Adherence, Drug Resistance)*_____
f. Disclosure *(probe areas: Family level, Sexual Friend)* _____

SECTION D – Knowledge management

21) In what format do you **MOSTLY** receive mHealth inform? (circle multiple)

i. Text
ii. Pictorial
iii. Audio
iv. Video
v. Other (specify) _____

22) What time of the day do you **MOSTLY** go online to access HIV related mHealth information? (circle response)

a. Early morning (around 6am to 9am)
b. Mid-morning (10am to 11am)
c. Noon (12 noon to 1 pm)
d. Afternoon (2pm to 4pm)
e. Evening (5pm to 7pm)
f. Night (8pm to 10pm)
g. Other (specify) _____

23) What is your MAIN reason for the chosen time? (circle one)

a. Availability of mobile phone
b. Privacy
c. Content downloads easy
d. Correspondence is instantaneous
e. Other (specify)_____

24) In which format would you MOST PREFER to receive mHealth inform? (Circle response - one)

a. Text
b. Pictorial
c. Audio
d. Video

25) What is the MAIN reason for the MOST PREFERRED format? (Circle response)

a. Attracts my attention.
b. I can distribute it in various ways.
c. Provides basic information on HIV health service and benefits.
d. Demonstrates steps of doing something.
e. I can engage with source of information.
f. Other (specify) _____

26) Where do you **MAINLY** keep/store information accessed on HIV?

a. My phone's memory
b. An SD Card that I can remove from the phone
c. A cloud-based system
d. I don't store any information

e. Other (specify) _____

27) What is the **MAIN** reason for preference of storage of information?

a. Bulkiness of information
b. Need privacy
c. Insecure with such information
d. That is how the system is designed
e. Fear stigma and discrimination
f. Staleness of information
g. Other (specify) _____

28) For how long do you keep/store mHealthHIV information accessed?

a. I delete immediately after reading
b. For a day
c. Two days
d. A week
e. A month
f. I never delete
g. Other (specify) _____

29) Which information do you **MOSTLY** seek on mHealth? (circle one)

a. Risk reduction *(probe areas: reducing sexual exposures, pre-exposure prophylaxis, blood transfusion, drugs and substance abuse).* _____
b. HIV testing *(probe areas: HIV test locations, HIV testing frequency, Confidential & Anonymous)*_____
c. Immune System *(probe areas: HIV Lifecycle, Stages of HIV Infection, Physical Changes)* _____
d. Understanding test results *(probe areas: Types of Lab Tests, CD4 Count, Viral Load, Drug resistance)* _____
e. Treatment options*(probe areas: Reasons to Start Treatment, Side Effects, Medication Adherence, Drug Resistance)*_____
f. Disclosure *(probe areas: Family level, Sexual Friend)* _____

30) What is the **MAIN** purpose of seeking the above information?

a. I have been advised by my care and treatment clinician.
b. All my friends are looking out for that kind of information.

c. I am aware of my situation and would like to know more.
d. My guardian / parents discuss with me around those topics.
e. I have a friend who needs information on those topics.
f. I fear that I might face some situations, thus the need to know more about the topics.
g. I have a personal behavior change goal in the said areas so looking out for information that can help me.
h. Other (specify) _____

31) How do you **MAINLY** utilize the above information from the three areas sought on mHealth?
a. I practice new ways of living.
b. I educate my peers on the same.
c. I use it to influence my decision on matters concerning my life.
d. Other (specify) _____

32) From your several searches, which HIV information do you think should be beefed up on mHealth? (Multiple answers)
a. About HIV transmission
b. HIV treatment
c. New programs in HIV management by government
d. Researches on HIV
e. Dealing with stigma and discrimination
f. Legal issues around HIV
g. Community activities on HIV
h. Other(specify) _____

33) What do you share **MOSTLY** in mHealth? (circle response)
a. About HIV transmission
b. HIV treatment
c. New programs in HIV management by government
d. Researches on HIV
e. Dealing with stigma and discrimination
f. Legal issues around HIV
g. Community activities on HIV
h. Other (specify) _____

34) Whom do you share with?

a. My friend
b. Siblings
c. Parents / guardian
d. Members of my support group
e. International community
f. Other (specify) _____

35) What format of mHealth information received do you share MOST?

a. Text
b. Pictorial
c. Audio
d. Video
e. Other (specify) _____

36) For **MOST** shared information, which method do you use?

a. Forward using mobile phone
b. In group counseling discussion during support group sessions
c. At community functions
d. Workshops on HIV
e. Others (elaborate) _____

37) Which platform do you share mHealth information on HIV?

a. Social media (Specify from the following list: Facebook, WhatsApp, YouTube, Instagram, Google, LinkedIn, Telegram, Twitter) _____
b. NGO Specific Mobile App (Specify from the following list: E and M Platform facilitated by K-MET, Youth ASK SMS Project facilitated by ADS Nyanza, GUSO facilitated by SR Alliance, FHOK, mTIBA) _____
c. Other (specify) _____

38) When sharing, you do add your views/thoughts on the information.

a. Yes.
b. No.
c. Sometimes

39) What format of mobile information would you **MOST** prefer?

a. Text
b. Pictorial
c. Audio
d. Video

40) Which of the following mHealth content would you prefer?

(circle one)

a. About HIV transmission
b. HIV treatment
c. New programs in HIV management by government
d. Researches on HIV
e. Dealing with stigma and discrimination
f. Legal issues around HIV

g. Community activities on HIV

SECTION E – TECHNOLOGY OBSOLESCENCE

41) Why do you consider the above (in question 40) mHealth content appealing? (Rank the answers)
   a. I get new information on the subjects
   b. Uses language (including slung and symbols) that I use a teenager
   c. Message is simple to understand without medical vocabulary
   d. It is from sources I know and acknowledge as credible
   e. It comes in a multimedia format (audio and video) making it interesting to listen and go through
   f. Other (Specify)_____

42) Which platform (sites/Apps) do you MOST prefer?
   a. Social media (Specify from the following list: Facebook, WhatsApp, YouTube, Instagram, Google, LinkedIn, Telegram, Twitter) _____
   b. NGO Specific Mobile App (Specify from the following list: E and M Platform facilitated by K-MET, Youth ASK SMS Project to facilitate by ADS Nyanza, GUSO facilitated by SR Alliance, mTIBA) _____
   c. Other (specify) _____

43) In the last five years (that is, 2017, 2016, 2015, 2014, 2013), how many times have you changed (got or given new one) your mobile phone?
   a. Once
   b. Twice
   c. Thrice
   d. Four times
   e. Five times
   f. Six times
   g. Never changed
   h. Other (specify) _____

44) Rank the reasons for changing mobile phone? (ranking)
   a. My model was wiped off the market so I had to buy another type
   b. My friends bought a new one so I also went for the same make as my friends
   c. My phone had problems with memory

d. My phone had problems with battery power
e. Some Apps cannot be downloaded in my old phone
f. Other (specify) _____

45) Is mHealth information packaged in line with how you communicate to your peers via mobile phone?
   a. Yes.
   b. No. (go to question 46)
   c. Not sure (go to question 46)

46) What would you like to see changed? (circle multiple)

   a. Language used
   b. Time of sending messages
   c. Format shared (text, video, visual)
   d. Other (specify) _____

SECTION F – SUSTAINABILITY THROUGH COMMUNITY-BASED HEALTH SYSTEMS (to the Community Health Worker of Nurse at the CCC)

47) Kindly indicate if the teenager has been involved at any **MESSAGE DEVELOPMENT** of mHealth Apps.:
   a. Yes (go to question 48)
   b. No. (go to question 49)

48) In what way(s) (multiple):
   a. Selecting mHealth HIV message package.
   b. Developing prototype of mHealth HIV message.
   c. Pre-testing of mHealth HIV message prototype.
   d. Process monitoring of utilization of mHealth HIV message package.
   e. Other (specify)_____

49) Kindly indicate if the teenager has been involved at any **SOCIAL MARKETING** of the mHealth Apps.:
   a. Yes (go to question 50)
   b. No. (go to question 51)

50) In what way(s) (multiple):
   a. Identification of influencers (publics – like teachers, health workers, guardians, religious leaders) of teenagers living with HIV and how mHealth could engage them.

b. Identification of partners (like schools, churches, community units with similar goals and how to engage them).
c. Identifying policies (required for maximization of mHealth message package to enable reduce barriers).
d. Review of competing needs and opportunity cost in access and utilizing mHealth packages.
e. Other (specify)

_____

51) Kindly indicate if the teenager has been involved at any **COMMUNITY ENTRY** level as highlighted below:
   a. Yes (go to question 52)
   b. No. (go to question 53)

52) In what way(s) (multiple):
   a. Identify objectives &evaluation criteria for mHealth indicators
   b. Conduct livelihoods analysis on teenagers living with HIV
   c. Education of teenagers on mHealth access and utilization
   d. Mapping of community linkages for teenagers on mHealth
   e. Other (specify) _____

53) Which of the following fund mHealth utilized by the teenager? (multiple)
   a. The church
   b. Health facility
   c. Non-governmental organization (NGO)
   d. Community based organization (CBO)
   e. Business persons
   f. Individuals
   g. Other (specify) _____

54) Which of the following do you think is **<u>BETTER</u>** placed funding sustainable mHealth?
   a. The church
   b. Health facility
   c. Non-governmental organization (NGO)
   d. Community based organization (CBO)
   e. Business persons
   f. Individuals
   g. Other (specify) _____

55) Why do you say so in question 53? (multiple)
   a. Sustained funding
   b. Community-based resourcing
   c. Getting donor support
   d. Long service history in the community
   e. Other (specify)_____

56) Is the teenager given incentive(s) by organizations to access their mHealth App?
   a. Yes (go to question 57) b. No

57) Which incentive(s) is the teenager given? (Multiple)

a. Airtime,
b. Mobile phones,
c. Points for accessing the Apps / sites
d. Exchange tours
e. Certificate of appreciation
f. Other (specify)_____

58) Has the teenager ever used an App (site) that prompts referral for medical attention?

a. Yes
b. No (Jump to question 63)

59) If yes, kindly rank (from high to low) referrals prompted for?

a. Seek counseling on HIV issues
b. Testing of HIV
c. Treatment of opportunistic infections
d. Contraceptive matters
e. Sexual assault
f. Others (specify)_____

60) Did you make the referral(s)?

a. Yes (go to question 60)
b. No(go to question 61)

61) If yes, what facilitated the process **MOST**?

a. Services referred to are available in my island
b. Distance to health facility is not an issue
c. Health care workers are receptive
d. There is an operational teenage friendly center at the facility
e. Referrals prompted are things I can get medical assistance at community level Others (specify) _____

62) If no, what did not facilitate the process **MOST**?

a. Services referred to are not available
b. Distance to health facility is an issue
c. Health care workers are not receptive
d. There is an operational teenage friendly center at the facility / no operation
e. Referrals prompted are things I can get medical assistance at community level / cannot at community level
f. Others (specify) _____

63) How **BEST** can you describe the referral process? (circle one)

a. It was easy to make appointments needed one
b. Appointment available within a reasonable amount of time
c. Keeping you reminded about your appointment

64) Which referral will you **MOST** appreciate if placed via mHealth Apps? (circle one)

a. Seek counseling on HIV issues
b. Testing of HIV
c. Treatment of opportunistic infections
d. Contraceptive matters
e. Sexual assault
f. Others (specify)_____

65) Due to mHealth, which of the following has the teenager **MOST** achieved under care and treatment?
a. Timely treatment because of communicating with the health facility.
b. Responsive to appointment dates prompted by my phone.
c. I cross check information related to my treatment online.
d. I report any anomalies (possibly skip of drugs due to ailments or away from home).
e. I connect with my friends for any treatment updates (talks, drugs) communicated to them.
f. I engage in safe sex as communicated by various HIV information sites – as a tool for prevention with positives.
g. Other (specify) _____ _____

66) Does the teenager use the mobile phone to prompt appointments?
a. Yes
b. No (jump to question 68)

67) If yes, for which appointments?
a. Drug picking
b. Psychosocial support group meeting
c. Drug taking
d. Others _____

68) What methods do they **MOST** use?
a. Mobile phone alarm with dates
b. Get calls from the health facility
c. Get calls from my treatment buddy
d. Pre-set SMS to send to self
e. Others _____

69) If No, why?
a. Mobile phones no private
b. Battery issues
c. Don't have enough memory space
d. Don't know how to use the phone to make reminders
e. Others (specify) _____

SECTION G – TREATMENT ACCESS BY TEENAGERS LIVING WITH HIV ON mHEALTH (to the Community Health Worker of Nurse at the CCC)

70) The teenager comes to the CCC having been referred by mHealth App.
   a. All times. b. Not all times.

71) What is the **MAIN** cause of referral?
   a. Risk reduction *(probe areas: reducing sexual exposures, pre-exposure prophylaxis, blood transfusion, drugs and substance abuse).*
   b. HIV testing*(probe areas: HIV test locations, HIV testing frequency, Confidential & Anonymous).*
   c. Immune System*(probe areas: HIV Lifecycle, Stages of HIV Infection, Physical Changes).*
   d. Understanding test results *(probe areas: Types of Lab Tests, CD4 Count, Viral Load, Drug resistance).*
   e. Treatment options*(probe areas: Reasons to Start Treatment, Side Effects, Medication Adherence, Drug Resistance).*
   f. Disclosure *(probe areas: Family level, Sexual Friend).*

72) Compliance for the teenager's self-referral via mHealth is excellent.
   a. Yes. b. No.

73) Teenager is referred to services available at the facility
   a. Yes. b. No.

74) The teenager adheres to treatment.
   a. Yes. b. No.

Questionnaire – Control Group

SECTION A – CONSENT

Introductory Letter Serial No._____

My name is OLAN'G ALFRED PHILIP BILL OKAKA, a doctorate student of Development Studies, in the School of Communication and Development Studies of Jomo Kenyatta University of Agriculture and Technology. This is to inform you (respondent) that the questionnaire being administered is for a study on ***effect of mHealth utilization on access to treatment by teenagers living with HIV/AIDS in***

island communities of Lake Victoria, for the fulfillment of the degree.It is hoped that the findings from the study will be used to recommend on factors influencing the same. If this is okay with you and of interest to generate more knowledge in the said areas, the research assistant will read to you this section.

> *"I hereby agree by voluntarily accepting to participate in the study. I understand that all the information that I provide will remain anonymous, and that researcher will not reveal my identity to any outside source without permission from me. I agree that the results of the overall study may be used for program design and research in the future by the researcher. I hereby grant the researcher permission to use my answers as part of their overall sample in their evaluation. The results of this research may be shared with others, but my identity may never be revealed."*

It is also important to note that it is only until you (respondent/the teenager) voluntarily allow to contribute to the study that she shall be engaged there after – this by signing below.

Name of Caretaker: _____ *ID Number:* _____

Date of Signing Consent: _____ *Phone:* _____

Island: _____ *Facility:* _____

Thank you.

SECTION B: SURVEY QUALITY CONTROL

(Fill section in CAPS)

Questionnaire serial number: _____

Name of island: _____

Name of health facility: _____

Name of health care worker: _____

Mobile phone (health care worker): _____

Name of support group: _____

Name of enumerator: _____

Mobile phone (enumerator): _____

Date of interview: _____

Time of interview (start): _____(end): _____

SECTION A – CHARACTERIZATION

1) Age of teenager (in years) _____

2) Sex of teenager (circle response)
   a. Boy
   b. Girl

3) Number of years of education taken (as of time of interview) _____

4) Which is your household status? (circle response)
   a. All parents alive
   b. Single parent – Mother
   c. Single parent - Father
   d. Child headed
   e. Other (specify) _____

5) Do you know when you were infected? (circle response)
   a. At birth
   b. Acquired
   c. Don't know
   d. Other (specify) _____

6) When were you first diagnosed as HIV positive ……Year?_____ Month?_____

7) When did you start treatment ……Year?_____ Month?_____

8) Have you ever changed your drug regimen? (circle response)
   a. Yes
   b. No

9) What information do you look for on matters of HIV? (circle multiple)

a. Risk reduction *(probe areas: reducing sexual exposures, pre-exposure prophylaxis, blood transfusion, drugs and substance abuse)*_____
b. HIV testing*(probe areas: HIV test locations,HIV testing frequency, Confidential & Anonymous)*_____
c. Immune System*(probe areas: HIV Lifecycle, Stages of HIV Infection, Physical Changes)*
_____
d. Understanding test results *(probe areas: Types of Lab Tests, CD4 Count, Viral Load, Drug resistance)*
_____
e. Treatment options*(probe areas: Reasons to Start Treatment, Side Effects,Medication Adherence, Drug Resistance)*_____
f. Disclosure *(probe areas: Family level, Sexual Friend)*
_____

10) Where do you look for (in question 9above) information?

a. At the health facility
b. Parents/ caregiver
c. Friends
d. Siblings
e. Teacher
f. Religious leader
g. Other (specify) _____

11) Any reason why you are not on mHealth? (more than one reason accepted).
a. Out of project coverage.
b. Cannot access a mobile phone.
c. Fear of stigma and discrimination due to disclose to those with mobile phones.
d. Does not see value addition for treatmentaccess.
e. Poor network coverage.
f. Other (specify) _____

SECTION B – TREATMENT ACCESS BY TEENAGERS LIVING WITH HIV ON mHEALTH(to caretaker at the facility – check hospital records)

12) Any time the teenagermake a self-referred (that is minus mHealth), they get services at the facility.
a. Yes
b. No

13) What are the main causes of referral?

a. Risk reduction
b. HIV testing
c. Immune System
d. Understanding test results
e. Treatment options
f. Disclosure

14) Is the teenager adhering to treatment?

a. Yes
b. No

Focus Group Discussion Guide

SECTION A (FGD)

Introductory Letter **Serial No._____**

My name is OLAN'G ALFRED PHILIP BILL OKAKA, a doctorate student of Development Studies, in the School of Communication and Development Studies of Jomo Kenyatta University of Agriculture and Technology. This is to inform you (respondent) that the interview being undertaken is for a study on ***effect of mHealth utilization on access to treatment by teenagers living with HIV/AIDS in island communities of Lake Victoria***, for the fulfillment of the degree. It is hoped that the findings from the study will be used to recommend on factors influencing the same. If this is okay with you and of interest to generate more knowledge in the said areas, the research assistant will read to you this section.

"I hereby agree by voluntarily accepting to participate in the study. I understand that all the information that I provide will remain anonymous, and that researcher will not reveal my identity to any outside source without permission from me. I agree that the results of the overall study may be used for program design and research in the future by the researcher. I hereby grant the researcher permission to use my answers as part of their overall sample in their evaluation. The results of this research may be shared with others, but my identity may never be revealed."

It is also important to note that it is only until you (respondents) voluntarily allow to contribute to the study that she shall be engaged there after – this by signing below.

Name of Informant: _____ *ID Number:* _____

Date of Signing Consent: _____ *Phone:* _____

Island: _____ *Facility:* _____

Thank you.

SECTION B (FGD)

1) Host Island _____

2) Date of interview _____

3) Guardians age, sex and years the teenagers under their care are living with HIV

Respondents Code	Age (years)	Sex		Years of education	Years living with HIV
		M	F		
R1					
R2					
R3 etc					

4) From your interaction with teenagers in this community, how would you describe their relation (frequency, changing, and purchase of airtime or bundles) with mobile phones?

5) In your opinion, how can mobile phones improve health outcomes of the island, especially among teenagers living with HIV? If yes or no, kindly elaborate.

6) Have you ever been involved in development (surveys, interface outlook, content, piloting, launch, monitoring and end surveys) of any mobile phone application? Please elaborate

7) What do you think is the most important thing a teenager living with HIV should know? Why? Kindly elaborate.

8) If teenagers living with HIV accessed the number one thing you propose, how are you equipped to collaborate with mHealth demands created?

9) In the event an organization developing mHealth App wishes to partner with you what benefits do you see for (i) the teenagers in this island, (ii) community, and (iii) the implementer?

10) Is there anything you would like to ask, comment on or add in relation to our topic? If yes, kindly do.

Thank you.

Key Informant Interview Guide

SECTION A

Introductory Letter Serial No._____

My name is OLAN'G ALFRED PHILIP BILL OKAKA, a doctorate student of Development Studies, in the School of Communication and Development Studies of Jomo Kenyatta University of Agriculture and Technology. This is to inform you (respondent) that the interview being undertaken is for a study on ***effect of mHealth utilization on access to treatment by teenagers living with HIV/AIDS in island communities of Lake Victoria*** for the fulfillment of the degree. It is hoped that the findings from the study will be used to recommend on factors influencing the same. If this is okay with you and of interest to generate more knowledge in the said areas, the research assistant will read to you this section.

"I hereby agree by voluntarily accepting to participate in the study. I understand that all the information that I provide will remain anonymous, and that researcher will not reveal my identity to any outside source without permission from me. I agree that the results of the overall study may be used for program design and research in the future by the researcher. I hereby grant the researcher permission to use my answers as part of their overall sample in their evaluation. The results of this research may be shared with others, but my identity may never be revealed."

It is also important to note that it is only until you (informant) voluntarily allow to contribute to the study that she shall be engaged there after – this by signing below.

Name of Informant: _____ *ID Number:* _____

Date of Signing Consent: _____ *Phone:* _____

Island: _____ *Facility:* _____

Thank you.

SECTION B (KII)

1) Host Island _____

2) Date of interview _____

3) Age of informant (in years) _____

4) Sex of informant _____

5) Profession _____ [Health Worker (Nurse, Doctor, Clinician, Lab Technologist, CHW), Administrator (Chief, Village Elder), Community Leader (Women leader, Youth, BMU Chair, Pastor), Business person, School Teacher]

6) Number of years of service in the island _____

7) Briefly describe mHealth App available in this region (island).

8) In your opinion, can mHealth improve health outcomes of the island, especially among teenagers living with HIV? If yes or no, kindly elaborate.

9) From your interaction with teenagers in this community, how would you describe their relation with mobile phones?

10) What would you describe as fashionable (type of mobile phone, kind of applications, messaging on HIV) for the teenage population in the island?

11) With examples, from your observation of teenagers from the island, how frequent do they change mobile phone handsets?

12) Have you ever been involved in development (surveys, interface outlook, content, piloting, launch, monitoring and end surveys) of any mHealth? Please elaborate

13) What do you think is the most important thing a teenager living with HIV should know? Why? Kindly elaborate.

14) If teenagers living with HIV accessed the number one thing you propose, how is your institution (health facility, school, church, administrative office) equipped to collaborate with mHealth demands created?

15) In the event an organization developing mHealth App wishes to partner with you (the institution) what benefits do you see for (i) the teenagers in this island, (ii) community, and (iii) the implementer?

16) Is there anything you would like to ask, comment on or add in relation to our topic? If yes, kindly do.

Thank you.

MAP OF ISLANDS


Meari
Mbita
Homa Lime
Kowuor
Sena
Olambwe Valley Forest
Ruma National Park

PROPOSED BUDGET

No.	Activity	Unit Cost (Kes)	HR	Days	Total
1	Transport to conduct FGDs & KIIs	5,000	5	1	25,000.00
2	Train research assistants	5,000	5	3	75,000.00
3	Stationery	2000	5	3	30,000.00
4	Communication (airtime)	2000	5	1	10,000.00
5	Accommodation and meals	5,000	2	7	70,000.00
6	Data entry	5,000	3	3	45,000.00
7	Contingency	5,000	1	1	5,000.00
					260,000.00