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CHARACTERIZATION OF MHEALTH USERS AND ACCESS TO TREATMENT BY TEENAGERS LIVING WITH HIV/AIDS IN ISLAND COMMUNITIES OF LAKE VICTORIA, KENYA

Olan'g Alfred Philip Bill Okaka[1], Florence Ondieki - Mwaura (PhD)[2], Prof. Maurice Sakwa (PhD)[3]

[1] PhD Scholar, Development Studies, Jomo Kenyatta University of Agriculture and Technology, Kenya
[2] Lecturer, Jomo Kenyatta University of Agriculture and Technology, Kenya
[3] Lecturer, Jomo Kenyatta University of Agriculture and Technology, Kenya

ABSTRACT

The emergence of mHealth as an alternative access point for care and treatment is lauded by development agencies as ingenious innovation for bridging health care access for teenagers living with HIV/AIDS among detached communities like the islands of Lake Victoria. It is also presumed that mHealth transcends beyond teenagers' concerns with location and unfriendly hours of operation of health facilities. The mHealth is alleged to increase privacy and confidentiality, reduce cost of service delivery, and loops over retrogressive cultural beliefs and attitudes exhibited by health care providers and caregivers, consequently increasing access to health information, care and treatment. Specifically, the study sought to establish the Characterization of mHealth users that facilitate access to treatment by teenagers living with HIV from the island communities of Lake Victoria and its effect on treatment access. To support this study, the study was anchored to Health Belief Model. This was anchored to the cross-sectional study design, stratified sampling identified the psychosocial support groups of teenagers living with HIV. Probit Model was applied to the study. With a study population of approximately 409 in Ringiti, Remba, Rusinga, Mfangano and Mageta islands, questionnaires were administered to the 173 sampled teenagers living with HIV as unit of analysis, and a control group made up of 30 percent of the sample ascertained effect of characterization of mHealth users on treatment access. Five focus group discussions and key informant interviews of 10 and 3 were held in each Island. The study adopted multiple linear regression analysis to determine the relationship between the Characterization of mHealth users and utilization of information by teenagers living with HIV/AIDS in Island Communities of Lake Victoria, Kenya. The study results revealed that characterization of mhealth users had a significant effect on access to treatment by teenagers living with HIV/AIDS in Island communities of Lake Victoria. Consequently, this study provides organizations promoting access to treatment by teenagers living with HIV/AIDS through characterization of mHealth Users.

The study recommended that government and organizations involved in HIV/AIDS related activities should adopt a culture of enhancing community-based health support systems. This could go a long way in ensuring there is improved access to treatment by teenagers living with HIV/AIDS in Island communities of Lake Victoria.

Keywords: M-health Information, Community Support Systems, Teenagers, HIV/AIDS, Island Communities

BACKGROUND INFORMATION

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 low-tech solution bridges the digital divide (Lane *et al.*, 2007) as growth of mobile phones is outpacing communication through mass media (Chipchase, 2005).

Unlike non-smart phone text messaging (SMS) services, with 3G 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).Around 2010 to 2015, Sub-Saharan Africa (SSA) 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 connections in SSA 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).

In Africa (Benin, Ghana, Senegal, South Africa, Tanzania, and Zambia), as opposed to general population, 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). 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). 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).

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).

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. 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.

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: K-MET's SRHR information (*e* and *m* platforms) and health insurance mTIBA, ADS Nyanza Youth ASK SMS Project; SRHR Alliance GUSO Project; Marie Stopes Kenya M4RH Project, JHPIEGO's TUPANGE Family Planning Project, among others, with continued funding to end by the year 2020. It is with this background that this study.

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 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.

STATEMENT OF THE PROBLEM

The emergence of mHealth as an alternative access point for care and treatment is lauded by development agencies as ingenious innovation for bridging health care access for teenagers living with HIV/AIDS among detached communities like the islands of Lake Victoria. It is also presumed that mHealth transcends beyond teenagers' concerns with location and unfriendly hours of operation of health facilities. mHealth is alleged to increase privacy and confidentiality, reduce cost of service delivery, and loops over retrogressive cultural beliefs and attitudes exhibited by health care providers and caregivers, consequently increasing access to health information, care and treatment. With increased access to mobile phones, it is presumed that mHealth can easily reach teenagers; a population missed out on national HIV/AIDS interventions. However, despite the growth in mHealth interventions and donor agencies lining up to support its scaling up, enrollment and adherence to treatment by teenagers living with HIV/AIDS in Kenya remains a challenge; a worrisome trend as HIV epidemic in subsequent years will be largely determined by the success made in slowing the spread among teenagers. The charaterization of mHealth users are critical for making informed

decisions on programming for teenagers on mHealth and living with HIV. Consequently, this called for a study to examine the effect of charaterization of mHelath users and access to care and treatment seeking behaviors among teenagers living with HIV and AIDS. This study, therefore, sought to examine the charaterization of mHealth users that facilitates access to treatment by teenagers living With HIV/AIDS in Island Communities of Lake Victoria, Kenya

RESEARCH OBJECTIVE

The objective of the study was to examine the effect of characterization of mHealth users on access to treatment by teenagers living With HIV/AIDS in Island Communities of Lake Victoria, Kenya.

THEORETICAL REVIEW

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 favourite mHealth network).

LITERATURE REVIEW

Unlike landlines, mobile phone usage in Africa has soared; now an integral part of the economy of African countries (Aker *et al.*, 2010). 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). 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).

Economic and technological advancements in SSA provide opportunities to develop mHealth solutions to improve health care (Deloitte, 2012, Open Global Mobile Survey). 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).

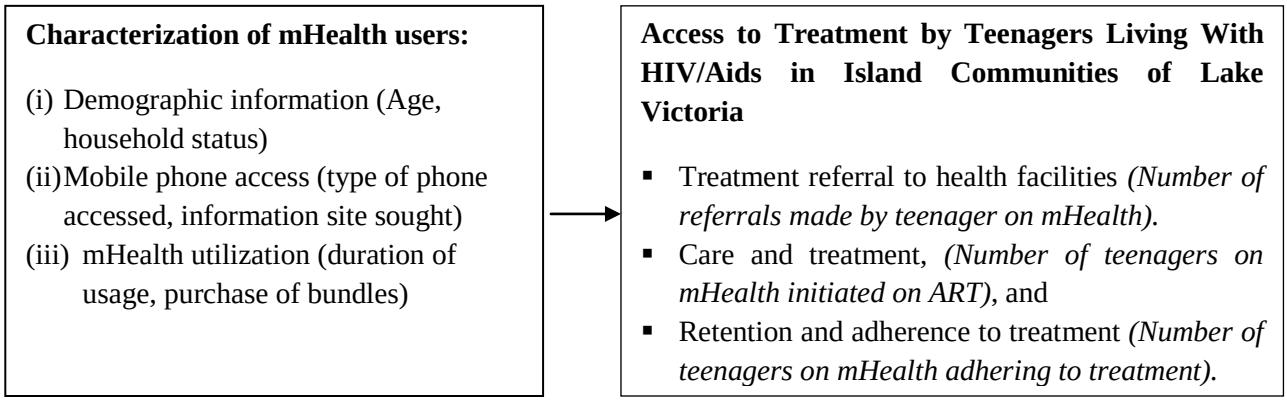
In low-income countries, the primary focus is on reducing health care costs, optimizing assets utilization and efficiency, delivering higher quality of care, and improving patient experience (The Mobile Economy Report, 2014). SSA, the focus is in improving access to basic health care, remote diagnosis, 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). 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).

Structured access is evident as, in a PMTCT study, 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). 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). The health care industry is thought to be the most promising new mobile phone growth channel (Deloitte, 2012, Open Global Mobile Survey)

Conceptual Model and Hypothesis

The proposed conceptual framework encompassed characterization of mHealth users (as independent variable) which affect access to treatment by teenagers living with HIV/Aids in island communities of Lake Lictoria (the dependent variable). This is illustrated below.

Independent Variable **Dependent Variable**



METHODOLOGY

Cross-sectional study design 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. 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. 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) and (ii) low provision of health care services (KAIS, 2014) due to the detachment from mainland and limited investment in healthcare infrastructure.

The population of the 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. Data on number of teenagers living with HIV/AIDS among island communities of Lake Victoria is not conclusive. Despite daily initiation of new patients (teenagers), it is still difficult to tell the exact number as decision to take a HIV test and later access treatment at designated points is entirely an individual's effort. Many a times, deaths of teenagers caused by co-infections from HIV/AIDS go undocumented. Consequently, a comprehensive list of teenagers on treatment cannot be generated. This study focused on teenagers living with HIV/AIDS and is on mHealth; and a control of the same who are not on mHealth. 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. The sample size for this study was estimated using the following statistical sample determination formulae below by William G. Cochran:

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

…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:
Nis approximately 409 (from health facility records – as of July 2017)
P=0.5**ME**=5% (0.05) $\mathbf{X^2}$= 3

$n = \frac{3*409*0.5(1-0.5)}{\left(ME^2*(409-1)\right)+(3*0.5*(1-0.5))}$ = *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. 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 were identified to help eliminated the influence of some extraneous factor (Campbell & Stanley, 1963); 30 percent of the sample size will apply as illustrated in Table 1.

Table 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**

RESULTS AND DISCUSSION

Based on the effect of characterization of mHealth users on access to Treatment by teenagers living With HIV/Aids in Island communities of Lake Victoria, the study sought to examine the mobile phone ownership and access by teenagers living with HIV/AIDS on mHealth. It was established that with regards to the access of a mobile phone, 20.3% of the respondents own a mobile phone. Given this fact, Table 2 shows access to mobile phones for teenagers who do not own one. Up to 44.9% rely on their parents to access mobile phones, while Siblings and healthcare workers were collectively at 5.1%. Of the phones accessed by teenagers, only 39.1% are Smart phones, that is, a cellular phone that performs many of the functions of a computer, typically having a touch screen interface, internet access, and an operating system capable of running downloaded applications.

Regarding the frequency of access to mobile phones, most teenagers indicated occasionally (only when the mobile phone owner is around them), and once and twice a day (in the morning or evening), accounting to 46.4% and 31.1% respectively. With regards to access to HIV information on the mobile phones, 29.7% of the respondents accessed alone. Notably, as indicated in Table 4.9 below, most of the teenagers at 63.8% accessed HIV information on mobile phone with a Caregiver.

This study sought to establish who buys airtime for mobile phones used by teenagers. Results in Table 1 indicates 65.2% were bought by those whom teenagers considered parents (Father, Mother, Uncle, Aunt, and Elder Cousins), while the Civil Society Organizations (NGOs and FBOs) getting contributed 1.4% respectively. In another development, a summary was collated on who buys internet bundles that the teenagers use. Table 3 below indicates the Civil Society Organizations (NGOs and FBOs) leads at 57.2%. Using both airtime and bundles, majority of teenagers, at 49.2% spend between 6 to 15 minutes accessing HIV information via mobile phones, while 24.7% of the respondents operate at a maximum of five minutes and less.

A key informant who overseas health programs in the County under the Anglican Development Services Project (ADS), has engaged young people on matters of SRHR through m-Health in Mfangano, Takawiri, Ringiti and Remba Islands. He alludes to the availability of m-Health 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 2.

Table 2: 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

Further, on the HIV/AIDS information searched by teenagers living with HIV/AIDS on mHealth, most teenagers searched information sources to understand test results and treatment options. In both the case and control groups, understanding test results and treatment options recorded a grouped score of 52.2% and 55.5% respectively. Table 3 below

indicates that matters of (collectively identified as HIV testing) attracted teenagers in the case and control groups respectively. As part of the study, no respondent alluded to seeking information on how to conduct disclosure at family, friends and or sexual partners.

This study sought to establish non-mHealth HIV related information resource points for the control group. Table 3 below indicates health facility and parents/guardians at 44.4% and 24.4% respectively led as information points, while teachers at 2.2% were least on the list. A key informant from a The DREAMS project supported by USAID, serving the girl child in Homa Bay County through mHealth, reaches adolescent and young girls 15-24 years who were newly initiated (18 months and below) on HIV/AIDS care and treatment. The main purpose of the project was to improve adherence among the girls by reminding them to take their drugs and whenever they were due for a clinic visit. The App. also motivated the girls in two ways; monetary motivation (they would receive some token on a weekly basis based on their interaction on the App) and psychosocial support (the App had pop-up messages that would periodically appear on their screens encouraging them to take drugs) to enhance to treatment.

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 3, the rest, at 14.5% used Text-based (SMS) to solicit for such information.

Table 3: 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

Correlation Analysis

The study sought to establish the relationship between characterization of mHealth users and access to treatment by teenagers living with the HIV. A Pearson Correlation was performed, and the result of the Pearson correlation test as presented in Table 4 below show a correlation ($r(138) = 0.318$; $p<0.05$) between the characterization of mHealth users and access to treatment by teenagers living with the HIV. This implies that the characterization of mHealth users is positively correlated to the access to treatment by teenagers living with the HIV. In addition, the correlation between these two variables was significant, that is $p<0.5$ implying a linear relationship between the characterization of mHealth users and access to treatment by teenagers living with the HIV. This shows that characterization of mHealth users had a significant effect on access to treatment by teenagers living with the HIV in the Islands of Lake Victoria.

Table 4: Correlation Analysis of Characterization of m-Health Users

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

Regression Analysis

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 m-Health 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 m-Health users.

Regression model summary results in Table 5 below indicate the goodness of fit for the regression between characterization of mHealth users and treatment access by teenagers living with HIV from island communities of Lake Victoria was satisfactory in the linear regression model. An R squared of 0.101 indicates that 10.10% of the variances in treatment access by teenagers living with HIV from island communities of Lake Victoria are explained by the variances in characterization of m-Health users. However, the model failed to explain 89.90% of the variation in treatment access by teenagers living with HIV from island communities of Lake Victoria. This means that there are other factors associated with treatment access by teenagers living with HIV from island communities of Lake Victoria which were not explained by the model. The correlation coefficient of 0.318 indicates characterization of mHealth users have a positive correlation with treatment access by teenagers living with HIV from island communities of Lake Victoria.

Table 5: Model Summary (Characterization of m-Health users and Access to Treatment)

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

The ANOVA results in Table 6 below shows that (F (1,136) = 14.688, p <0.05). This shows that the overall model significant. The findings imply that characterization of mHealth users was statistically significant in explaining treatment access by teenagers living with HIV from island communities of Lake Victoria. Therefore, at p <0.05 level of significance, null hypothesis is not supported.

Thus rejected and the alternative hypothesis (H_{a1}) which states that "There is a significant relationship between characterization of mHealth users and treatment access by teenagers living with HIV from island communities of Lake Victoria" is accepted implying that characterization of mHealth users have significant effect on treatment access by teenagers living with HIV from island communities of Lake Victoria.

Table 6: ANOVA Statistics (Characterization of m-Health users and Access to Treatment)

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			

Regression of coefficients results in Table 7 shows that there is a positive and significant relationship between characterization of mHealth users and treatment access by teenagers living with HIV from island communities of Lake Victoria as supported by a p<0.05 and a beta coefficient of 0.388. This implies that a unit increase in characterization of m-Health users would increase the treatment access by teenagers living with HIV from island communities of Lake Victoria by 0.388 units. This was supported by the t values whereby t cal= 9.023 > t critical =1.96 at a 95 percent confidence level which depicts that we reject the null and accept the alternative hypothesis. Further, this confirms the positive effect of characterization of m-Health users on treatment access by teenagers living with HIV from island communities of Lake Victoria. The fitted equation is as shown below: $Y= 4.876 + 0.388X_1$ that is treatment access by teenagers living with HIV from island communities of Lake Victoria = 4.876 + 0.388 Characterization of mHealth user.

Table 7: Regression Coefficients (Characterization of m-Health 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

CONCLUSION & RECOMMENDATIONS

The study examined the characterize m-Health 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 m-Health 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 m-Health utilization by teenagers and provided opportunities to develop m-Health solutions to improve health care. Characterization of m-Health 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 recommends that there is need for the technology accessible by teenagers such as, simple text messaging to improve treatment compliance and applications for diagnostic and treatment support. The focus should be improving access to basic health care but teenagers living with HIV/aids in Islands of Lake Victoria.

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