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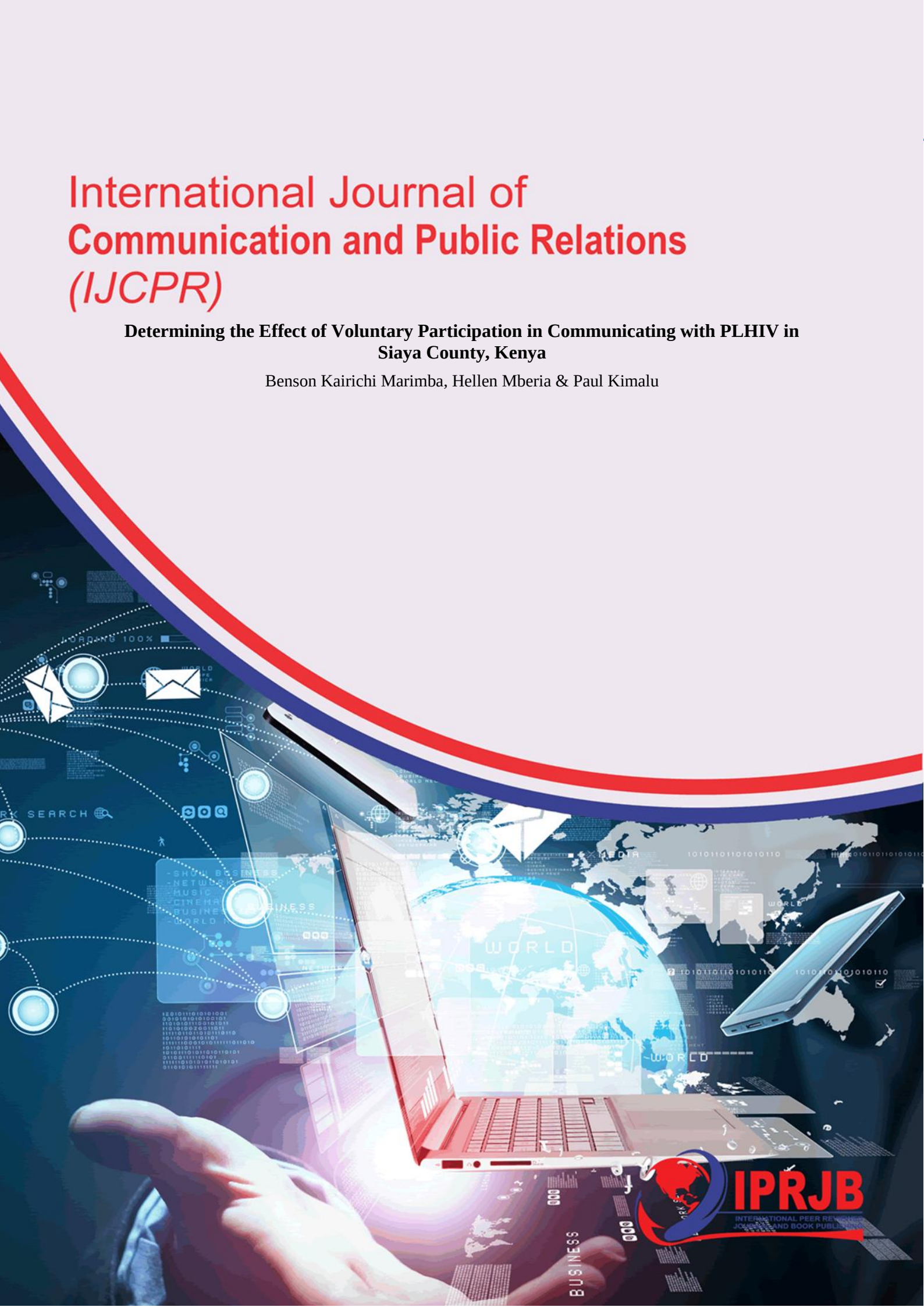

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Determining the Effect of Voluntary Participation in Communicating with PLHIV in Siaya County, Kenya

Benson Kairichi Marimba[1*]
Postgraduate Student, School of Communication & Development Studies, Jomo Kenyatta University of Science & Technology
Corresponding Authors Email:

Hellen Mberia[2]
Principal, JKUAT, Karen Campus, Nairobi

Paul Kimalu[3]
Lecturer, Jomo Kenyatta university of Science & Technology

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Abstract

Purpose: This research aimed to determine the effect of voluntary participation in communicating with PLHIV in Siaya, Kenya.

Methodology: This study utilized a descriptive research approach and inferential design through a field survey, employing two distinct sets of questionnaires. One was administered to the key informant and the other to Persons Living with HIV (PLHIV). Spearman's rho correlations and simple linear regression models were also applied to assess the association between voluntary engagement as the independent variable and communication as the dependent variable. ANOVA test was also performed to test the hypothesis and results were presented in tables.

Findings: The study comprised a sample size of 376 individuals, constituting 96.18% of willing respondents who agreed to participate in interviews. Seventeen unresponsive records were excluded from the analysis. A Normality Test was conducted to assess whether the study sample was drawn from a population with a normal distribution. Under the null hypothesis, no significant difference was found between the sample and the population it represented. Consequently, there was substantial evidence to reject the null hypothesis and accept the alternative hypothesis (p-value=0.000 CI=95%). Moreover, the findings revealed that 82.30% voluntarily enrolled in the Text for Adherence (T4A) mobile app, 70.71% signed the consent form, and 6.07% indicated that consent was implied.

Unique Contribution to Theory, Practice and Policy: This study extends Technology readiness theory studies to mhealth field where it is beginning to gain traction. It also indicates the significance of individuals willingly participating in mHealth interventions upon enrollment. Voluntary participation is an imperative condition of any research undertaking. This study's results additionally confirmed that mHealth interventions enhance the well-being of individuals managing chronic illnesses. This study is likely to inform policy changes and or amendments in the mhealth space in many jurisdictions. An intervention such as Text for Adherence (T4A) may encourage the government to support system developers. It can also take over the project as a public health investment instead of leaving it to private sector or non-governmental organizations. Study further extends the body of knowledge in use of mhealth interventions.

Keywords: *Voluntary Participation, Persons Living with HIV (PLHIV), Text for Adherence (T4A).*

1.0 INTRODUCTION

HIV and AIDs present a huge public health problem globally since 1981 when the first case was reported. Globally in 2022, there were 39.0 million living with HIV (The path that ends AIDs. 2023 UNAIDS Global AIDS Update). This HIV burden 'varies considerably between regions of the world and within countries. Sub-Sahara Africa, Asia and the pacific together bear about 82% of the global HIV burden (The path that ends AIDs. 2023 UNAIDS Global AIDS Update).The cost of keeping HIV infected persons alive through provision of antiretroviral therapy is high with "UNAIDS goals for 2020 [being] to have diagnosis of 90% of those infected, 90% of those infected will be on treatment and in 90% there will be viral suppression". All these measures call for huge financial outlays. Countries especially Sub-Sahara Africa have many other pressing needs like dilapidated infrastructure, poor health care system, and undeveloped agriculture among others.

Iwuji and Newell (2017) suggested that many people around the world have not been tested and therefore its "difficult to estimate the actual burden of HIV infection, resulting in poor clinical outcomes and continued spread of infection". Large scale testing and the resultant campaigns to encourage voluntary testing are also costly especially for the global south, which continue to suffer malnutrition and systemic droughts. Furthermore, and according to Yoshimura (2017), those untested for HIV status continue to be a serious threat to communities because "the incubation period of HIV-1 from infection to the development of AIDS ranges from 8 to 11 years". This is a long time and infected persons can unwittingly spread the virus to healthy populations.

Research has established that those HIV positive persons who are on anti-retroviral drugs and register low CD4 counts cannot transmit the virus. However, the numbers of undiagnosed persons remain high. Thus, Persson, Kelly-Hanku and Mek (2023) posit that "with effective antiretroviral therapy, an "undetectable" viral load renders HIV "non-infectious" and "untransmitable" between sexual partners". Nevertheless, HIV epidemic remains an expensive condition and Yoshimura, sums it up-thus "in the past 3 decades, HIV has caused a great burden to global wealth and health, ….[and unfortunately], since 1981, more than 78 million people have been infected with human immunodeficiency virus (HIV) resulting in 35 million deaths". However. there appear some gains in reducing mortality among HIV infected persons as suggested by Kharsany and Karim (2016), who argue that even though "global trends in HIV infection demonstrate an overall increase in HIV prevalence [there is a] substantial decline in AIDS related deaths largely attributable to the survival benefits of antiretroviral treatment." Unfortunately, they continue to add, "Sub-Saharan Africa [leads], accounting for more than 70% of the global burden of infection" and that HIV prevention interventions have the ability to reduce the global HIV burden.

Kharsany and Karim (2016) further observed that two out of three new infections each day around the world, occur in Sub-Sahara region and women and girls "bear a disproportionate burden "and unfortunately gaps exist in women -initiated HIV prevention interventions because of their inability to negotiate for safe sex options". Kharsany, et al's view is that an AIDs free generation will not be possible without curtailing infection in young women through prevention interventions.

The positive health outcomes of mhealth interventions have been documented (Xiong, Berkhouse, Schooler (2018) Kossea, Bouvya, de Vriesb, Kostera (2019), Cooper, Clatworthy, Whetham & Consortium (2017). Voluntary participation is central in uptake of ehealth services through mobile phones. A review of a number of recent studies in mhealth field has established

that there are improvements in adherence to medication and appointment reminders. If patients are reminded to take medications and visit medical facilities for appointments, their health status would improve greatly. This is the evidence coming through from some of the studies reviewed. For instance, Xiong, Berkhouse, Schooler, *et al.* (2018) reviewed 21 studies of mhealth interventions in a high- income country. This "systematic review found evidence that mHealth interventions improved medication adherence and blood pressure control among people with hypertension". This finding suggests that voluntary participation is essential if PLHIV and other chronic illnesses are to benefit from mhealth interventions.

Kossea , Bouvya , de Vriesb and Kostera (2019) in a study focusing on adolescent asthmatics also established that " there was a positive effect of the intervention [mhealth] on medication adherence (MARS +2.12, p = 0.04)". This is also supported by Cooper, Clatworthy, Whetham & Consortium (2017) suggest that ehealth strategies "have increased the accessibility of self-management interventions…." and are cheaper than face to face interactions and that "mHealth has the potential to provide consistency in the delivery of interventions across a wide population at low cost". Furthermore, Muessig, LeGrand, Horvath, Bauermeister & Hightow-Weidman (2017) also posit that owing to the flexibility of mHealth interventions, it is possible to deliver tailored content to patients via phones and this in itself reduces "some societal and structural barriers….and offers strong capability for scalability and diffusion across geographic locations, including within resource-limited settings". Indeed, with increased penetration of mobile phones around the world, mhealth interventions will be used to reach patients who suffer various health conditions apart from HIV and AIDs. McCrocklin (2020) suggests that by 2025, there would be 5.8 billion people owning mobile devices in the world.

On the other hand, Haldane, Koh, Srivastava, Teo, Tan, Cheng (2019) also support mhealth interventions through short text message services and suggest that "the use of mobile health (mHealth) has gained popularity globally [even though] there are challenges to the use of mHealth, particularly among older users who have a large heterogeneity in usability and accessibility barriers when using technology". Firth, Cotter, Torous, Bucci, Yung (2016) also suggest smartphones promote attendance "at healthcare appointments and medication adherence…communicate test results and monitor patients symptoms in real time" and further add that there is a growing body of literature which has examined the efficacy of health interventions delivered through mobile phones for a wide range of outcomes". This is also supported by El-Noor, Aljeesh, Bottcher, El-Noor (2021). This study is also consistent with these studies.

Sampled literature on voluntary participation as an ethical consideration and a requirement of research undertakings indicate that in some situations it goes beyond a participants consent to societal and cultural dictates. Thus, Marshall, Adebamowo and Adeyemo *(2014*), suggest that "informed consent and some individuals or communities may also be vulnerable to coercion because of their poverty or social and political conditions that affect voluntary participation. Additionally, beliefs about individual freedom and decision-making capacity are embedded within cultural and social patterns of family ties and community obligations". This means that for married women, consent of their husbands may be sought before they can agree to participant in research. Therefore, marital status is an influencer to voluntary participation in research. Marshall et al, further probed women in their breast cancer study on what it meant to participate voluntarily and some respondents stated that "it is having the freedom to choose whether or not join the study …and that the decision to join the study was not forced or compulsory". Indeed, in order to demonstrate the notion of free will one breast cancer patient stated that it is "to have the free will –you are not compelled to do it; you have your option.

[Furthermore], "an important aspect of voluntary participation in research is the capacity to withdraw from an ongoing study"at any stage.

On the other hand, and in medical education and practice … "patients' are objectified and made powerless and thus become unable to make decisions about their own situations. The predominant ethics within the health sector are utilitarian ethics which regard the individual as means to an end" and therefore their explicit consent to participate voluntarily is often taken for granted (Scocozza, 1989).

Voluntary participation is premised on the ethics of research where respondents are clearly informed about the research, are requested to participate, given consent forms to sign signifying their willingness to take part. They are also informed of their right to withdraw this consent at any stage of the process and that there would be no consequences for doing so. Bill (2021) summarises this by suggesting that, "subjects in a research project must be aware that their participation in the study is voluntary, that they have the freedom to withdraw from the study at any time without any unfavorable consequences, and they are not harmed as a result of their participation or non-participation in the project". Free will is the central idea behind voluntary participation.

There is a connection between voluntary participation and informed consent. This means that before a research subject agrees to take part in the activity, they need to be fully informed about the purpose of the research and why it is necessary in terms of benefits to society and their right to withdraw. Thus, "Informed consent is important: in research, [as] it allows subjects to make an informed and voluntary choice to participate or refuse to participate in a project" (Cahana & Hurst, 2008).

Objective

To determine the effect of voluntary participation in communicating with PLHIV in Siaya, Kenya

Study Hypothesis

H_0: There is no significant relationship between voluntary participation and communicating to PLHIV in Siaya, Kenya

H_1: There is significant relationship between voluntary participation and communicating to PLHIV in Siaya, Kenya

2.0 LITERATURE REVIEW

Theoretical Framework

This study draws from mass communication field and looks at the use of cellular phones to communicate to HIV infected persons. Mass communication theories alone could not explain up take of mhealth. This therefore, required the researcher to look into technology recognizing that technology is used for communication. Considering the researchers concern was uptake of mhealth interventions, Technology Readiness (TR) and Technology Acceptance Model (TAM) were found suitable as determinants that influence consumers to purchase tech products or services offered online. Such services include enrolling on mhealth apps. TR and TAM suggest that up take of technology is influenced by a person's personality (Porter & Donthu, 2006). TR can be traced to Parasuranam (2000), who introduced the technology acceptance index (TRI). This index suggests' 4 personality constructs that help to "explain how consumers respond to adoption of technology". These constructs are optimism, innovativeness, discomfort, and insecurity. Panasuraman's suggestions are supported by Lai, 2017, Başgöze,

2015, Colby, 2001). Indeed, Başgöze, (2015) [while] citing Parasuraman, (2000) defines TR, as the adopters' willingness to accept and use technology to achieve stated goals in their lives and in business." The existence of optimism and innovativeness constructs enhance the willingness to embrace technology, whereas feelings of discomfort and insecurity can deter its adoption (Parasuraman, 2000).

Basgoze (2015) introduced two additional constructs, perceived usefulness and ease of use, expanding the Technology Readiness model into the Technology Readiness Acceptance Model. Together with Parasuraman 4 constructs, Technology Acceptance Model has six constructs as shown in figure 1. According to Marimba, Mberia and Kimalu (2023) the "moderating constructs help to explain why patients who suffer chronic illnesses would agree to enroll onto an mhealth platform. [Thus], even if they are persuaded to sign up, they can only do so because they perceive the service as useful and easy to interact with."

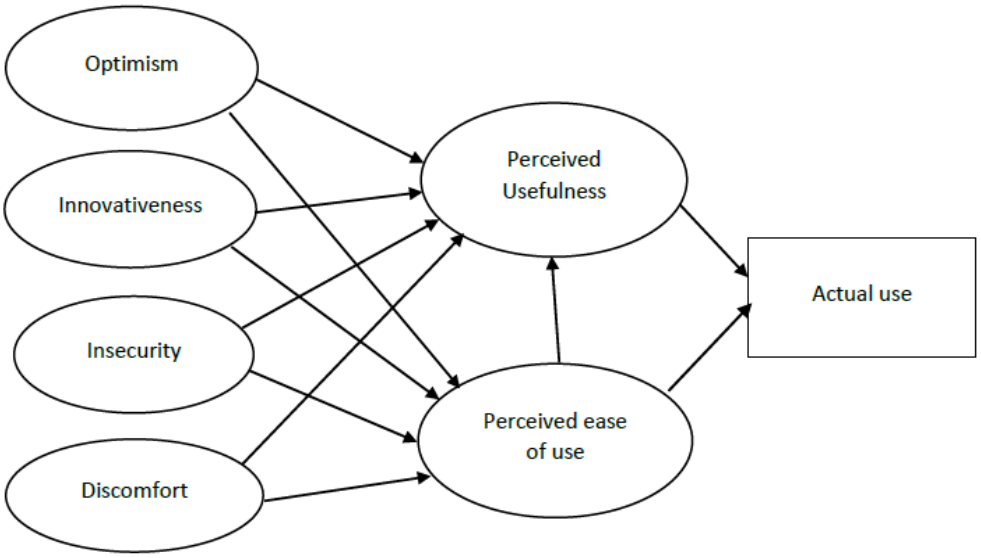

Figure 1: TRAM

Source: Lin et.al. (2007)

Diffusion of Innovations (DOI) was the second theory. DOI can be traced to Rogers in 1962. This theory DOI has been used extensively in behaviour change communication. Ymcaust (2019) citing Rogers define diffusion as "the process in which an innovation is communicated thorough certain channels over time among the members of a social system". This description delineates the elements of diffusion as innovation itself, communication channels, time, and the social framework through which the innovation spreads.

Littlejohn & Foss (2009), supports the use of DOI in communication studies and suggests that "diffusion is of importance to communication because introducing an innovation in a social system is in itself a communication process involving persuasion to buy a product, service or adopt a behaviour change". This is supported by Marimba, Mberia & Kimalu (2023) who posit that participation in mHealth platforms and engaging with PLHIV supports the communication aspect, especially concerning the adoption of new innovations, such as those applied in mHealth interventions.

The third theory was Utilitarian or Happiness. This ethical theory is attributed to Jeremy Bentham, (1780) and is utilized to determine ethical judgments by emphasizing the consequences of a specific action in terms of what is considered right or wrong. Utility is the

central idea of this theory and suggests that life ought to maximize overall happiness, where actions are deemed right when they're intended to create happiness and considered wrong if they fail to generate happiness. John Stuart Mill, (1863), extended Bentham's theory by arguing that man should seek pleasure and avoid pain. Chonko (2019) further observes that the acceptable outcomes of our actions are those that bring about "greatest good for the greatest number of people". It is the view of this study that those actions have to be legally acceptable.

It is not difficult to appreciate the relevance of Utilitarian Theory to this study because mhealth interventions such as T4A being offered to HIV patients would bring happiness to thousands of people infected with HIV, who benefit by upscaling adherence to medication and doctors' appointments because of text message reminders. Adherence has been proven to improve health status as result of enrolment to T4A. Thus, a greater good is therefore achieved for legions of patient's and this is the foundation upon which this ethical theory is anchored.

3.0 METHODOLOGY

The study used a descriptive research design. Creswell (2002) suggests "descriptive research is used to describe characteristics of a population or phenomenon being studied".

PLHIV in Kenya were the target population. However, national HIV prevalence determined the study site and Siaya was selected because it was leading in HIV prevalence nationally as per the Kenya AIDs Response Progress Report (2018). This report showed that the five counties account for 79% national prevalence as shown in Table 1.

Table 1: HIV prevalence in 5 leading counties (2018 statistics)

No.	Name of County	Prevalence Rate
1	Siaya	21.0%
2	Homa Bay	20.7%
3	Kisumu	16.3%
4	Migori	13.3%
5	Busia	7.7%
	Total	**79%**

Moreover, selecting Siaya for the study was based on high mhealth enrolments in the country. There were 9 mhealth system supporters in the country and this became the population. Therefore, the overall health facilities in Siaya amounted to 101. However, within the scope of this study, there were 9 supporters of the mHealth system and 21 active health facilities integrated into the T4A mHealth system that were accessible for investigation. The registered PLHIV in those 21 facilities were 12,886.

The 9 system supporters were further segregated by the nature of medical records they kept. Out of these supporters represented in table 2, open Medical Records (MRS), Kenya Electronic Medical Records (EMR) and IQCARE were removed from the study because they do not offer SMS interventions. The rationale behind this is that any SMS communication originating from IQCARE and Kenya EMR occurs through T4A, integrated as part of the Interoperability Layer (IL), as outlined by Marimba et al. (2023). As T4A was already integrated into the systems under study, these two were excluded. Additionally, WelTel, a mobile-based solution, was also removed from consideration because it operates in Isiolo, a county with notably low HIV prevalence. Further, it was established that lab results from mLab were not sent to patients directly and therefore this intervention was also expunged leaving

only T4A system or ushauri for the study. The mhealth System providers operating in Kenya are indicated in Table 2.

Table 2: Mhealth System Providers/Supporters

No.	System Name	Supporter	Type of solution	Location
1.	mLab	Mhealth Kenya	Sms	Homabay
			Sms	Siaya
2.	T4A	Mhealth Kenya	Sms	Homabay
3.			Sms	Siaya
4.	weltel	Weltel	Sms	Isiolo
5.	mUzima	Faces	Sms	Kisumu
6.		FACES	Sms	Kisumu
7.	(IQCARE)	Palladium	Electronic Medical records	Eldoret & Siaya
8.	Open MRS system	Ampath	Electronic Medical records	Uasin Gishu
9.	Kenya EMR	Palladium	Electronic Medical records	National presence

Source: Marimba, B., Mberia, H., & Kimalu, P. (2023)

Sample & Sampling Technique

The study used a probabilistic sampling technique. To select health facilities, random method was used which ensured each of the 21 facilities active on mshauri had an equal chance of being selected. These facilities were drawn from the 6 sub-counties of Siaya County. The combined enrollment of PLHIV was 12,886. Fifty two percent (52%) or 11 facilities out of the 21, were randomly selected. This was considered adequate based on the expansive nature of the County which has an area of 2,496 square kilometres.

Sampling was carried out as follows:

Step 1

Health facilities were identified by their MFLNo. These are recorded in an ascending order. The 21 facilities were divided by 11, resulting in an interval of 2. The starting point was determined by randomly selecting one among the 1st and 2nd MFLNo, and MFLNo 13471 was chosen as the initial reference point. From there, one MFLNo. was incrementally counted and selected until a total of 11 facilities were obtained.

Step 2

The population for the 11 randomly selected health facilities was 8,921 out of 12,886 which consisted of consented and non -consented cohorts.

Step 3

Random selection of PLHIV

Sample Size Formula

n=	$t^2 \times p(1-p)$
	m^2

$$n = \frac{z^2 p(1-p)}{m^2}$$

$$n = \frac{1.96^2 \times 0.5(1-0.5)}{0.0511^2}$$

$$n = \frac{3.8416 \times 0.25}{0.002611}$$

$$n = 367.7988$$

$$n = 368$$

Where:
n= required sample size
t=confidence levelat 95%(standardvalueof1.96)
p= expected prevalence or proportion
m = margin of error at 5% (standard value of 0.05)

Enrollments of PLHIV as would be expected in all facilities was not uniform. and therefore, a proportionate random sampling method was used in order to determine the sample size for each facility. Thus, "the product the population sample size for each health facility and the total sample size (368) was divided by the total PLHIV for the 11 sampled facilities, which is 8,921 patients. The results were 344 consented sample while 24 were non-consented" Marimba, Mberia & Kimalu (2023). The non-consented cohort of 24 was raised to 30 as suggested by Sharma (2020) who argue "the minimum of 30 observations is sufficient to conduct significant statistics" in correlation research. The total sample size was therefore 374 (368 + 24+ 6). This figure rose to 376 with additional two records during data collection. This study was designed to test if there was improved health outcomes as result of being enrolled into the T4A intervention between those whose consented to enroll and those that did not. Sampling PLHIV respondents was also random with every 3rd PLHIV attending the clinic identified with a random start. Table 3 shows the 21 facilities.

Table 3: Number of 21 Health facilities

MFL NO	Facility	No. Clients on Ushauri/ Consented	Non-Consented	Total Clients	Appt4a	Sampled patients by facility	Consented Clients	Non-Consented Clients
13471	Akala Health Centre	1171	76	1247	T4A	51	48	3
13476	Ambira Sub-District Hospital	497	267	764	T4A			
13507	Bondo District Hospital	2152	33	2185	T4A	90	89	1
13588	Got Agulu Sub-District Hospital	418	13	431	T4A			
13590	Got Matar Dispensary	226	5	231	T4A	10	9	0
13600	Hawinga Health Centre	288	11	299	T4A			
13644	Kagwa Health Centre	103	165	268	T4A	11	4	7
13747	Madiany S.C Hospital	93	9	102	T4A			
13750	Mageta Dispensary	279	8	287	T4A	12	12	0
13780	Masala Dispensary	396	10	406	T4A	17	406	17
13837	Naya Health Centre	520	8	528	T4A	22	21	1
13845	Ndori Health Centre	337	2	339	T4A			
13944	Nyathengo Dispensary	404	33	437	T4A	18	17	1
13961	Ogam Dispensary	265	8	273	T4A			
13987	Ong'ielo Health Centre	876	1	877	T4A	36	36	0
14080	Siaya District Hospital	830	20	850	T4A			
14085	Sigomere Health Centre	206	218	424	T4A	17	8	9
14148	Ting'wangi Health Centr	120	3	123	T4A			
14156	Ukwala S.C Hospital	707	28	735	T4A	30	29	1
14159	Urenga Dispensary	366	12	378	T4A			
14164	Usigu Dispensary	1698	4	1,702	T4A	70	70	0
		11952	934	12886		368	344	24

Data Collection Tools

This study was a field survey and used two sets of questionnaires to conduct the interviews. One set was a self- administered tool for the key informant, who was the T4A system developer and the other to 376 respondents who were PLHIV. Using other methods especially qualitative was deemed inappropriate due to the HIV status of the respondents who remained anonymous through the interviews process. Their files held at the clinics only had numbers and not patients' name. This safeguard meant that only the medical staff attending to them would know their HIV status.

Research Design

The study utilized a descriptive and inferential research design, predominantly employing a quantitative approach. Data collection involved administering two sets of questionnaires, and the analysis was conducted using SPSS and STATA software.

Data Collection Methods

Data was collected through a self -administered questionnaire to a key informant who was a T4A intervention developer and oral interviews from individual respondents randomly selected from 11 health centres, which were active during the study period. The study mainly obtained quantitative data.

Data Analysis

Descriptive and inferential methods were used to analyze quantitative data. After data was collected, it was imported into SPSS version 25 and STATA to facilitate analysis. Further, Kolmogorov-Smirnov test was performed to establish that the data came from a normal distribution. This test, and according to Marimba, et al (2023) commonly known as normality test "is used to test the null hypothesis that a set of data comes from a Normal distribution". In order to determine the ethical consideration of voluntary participation as an independent variable, logistic regression and ordinary linear regression models were used against the dependent variable of communication interventions.

4.0 FINDINGS

Results, Response Rate and Profile of the Respondents

The response rate reached 96.18%, contributing a total of 376 records for analysis. Baruch and Holton (2008) propose that assessing the response rate is crucial for gauging the significance of research findings. The gender-specific response rate, as depicted in Table 4, aligns with the Kenya Population- Based HIV Prevalence Assessment (2018), "which established a difference in HIV prevalence between women and men (women at 6.6% (95% CI: 6.0%-7.1%) compared to men at 3.1% (95% CI: 2.7%-3.5%)". This study is also in line with similar studies conducted from fishing communities which also demonstrated prevalence of HIV is higher in females (Okello, 2013). Generally, as Kwena (2010), Glynn, & Buve, 2001, Amornkul & De Cock, 2009).

Bukusi (2019) also found a marked difference in HIV prevalence around the beaches in the Lake region between women (38%) and men (29%). As per UNICEF (2020), adolescent girls are particularly vulnerable due to the prevalence of the 'sex for fish' practice, which is identified as a contributing factor to Homa Bay having one of the highest HIV rates in Kenya and being a hotspot for teenage pregnancies. Indeed, this disproportionate HIV infections among women compared to men is widespread in all fishing communities around the lake.

The respondents age was distributed in 6 clusters ranging from 18- 58+ as shown in Table 4. The findings are ages 26-33 were 25.80%., while 26 to 49 account for 72.30% out of the 376 respondents. On marital Status, 66.22% were married, 17.82% were widowed, and 13.03% were single. The higher HIV prevalence among married individuals, particularly affecting women, is consistent with findings from earlier studies and is attributed to factors such as the exchange of fish for sex (Fagbamigbe et al., 2016; Kwena et al., 2019). This means fishermen use fish to secure sexual favours from women fish mongers.

On education level, findings show primary school were 51.60%, secondary school at 31.91% and 1.33% of the respondents had university education. The employment status of respondents reveals that 68.62% were unemployed, 23.67% were engaged in informal employment, and 7.71% held formal employment. As for respondents' income, 58.51% reported earning Kshs 10,000 or less, followed by 13.03% with an income of Kshs 20,000 or less, and 4.52% earning Kshs 30,000. A mere 1.06% reported an income exceeding Kshs 40,000. Previous studies have consistently linked higher education, increased income, and lower HIV prevalence rates (Whitworth et al, 2005, Olamoyegun et al, 2014) who equates education to an HIV 'vaccine'. Details are indicated in Table 4.

Table 4: Demographic Characteristics

Attribute	Category	Number of Respondents	%
Gender	Female	225	59.8%
	Male	151	40.2%
Age bracket	18-25	31	8.2%
	26-33	97	25.8%
	34-41	91	24.2%
	42-49	84	22.3%
	50-57	37	9.8%
	58 +	36	9.6%
Marital Status	Cohabiting/Live-in partners	1	0.3%
	Divorced/separated	10	2.7%
	Married	249	66.2%
	Single	49	13.0%
	Windowed	67	17.8%
Level of Education	College level	31	8.2%
	None	26	6.9%
	Primary school level	194	51.6%
	Secondary school level	120	31.9%
	University & above	5	1.3%
Employment Type	Formal employment	29	7.7%
	Informal employment	89	23.7%
	Unemployed	258	68.6%
Where do you get money to support your needs?	*Boda boda* operator	3	1.2%
	Business	94	36.4%
	Farming	94	36.4%
	Family members	42	16.3%
	Fishing	12	4.7%
	Jua kali	10	3.9%
	None	3	1.2%
Income level	</=10,000 pm	220	58.5%
	</=20,000 pm	49	13.0%
	<=/30,000 pm	17	4.5%
	None	86	22.9%
	Over 40,000 pm	4	1.1%

N= 376

Provision to Withdraw from Participation

The research objective was to determine the effect of voluntary participation in communicating with PLHIV in Siaya, Kenya. The option to withdraw was one of the indicators of voluntary participation. Data indicate that 77.39% stated that they were informed that they could withdraw at any stage and 22.39% stated that they were not given an option to withdraw their participation. voluntary participation is supported by Adeyemo, *et al* (2014) who "established that a majority of respondents indicated that their participation was voluntary". Table 5 show the details.

Table 5: Were You Given a Provision for Withdrawal from the System at Any Stage?

Response	Freq.	%	Cum.
Yes	267	77.39	77.39
No	78	22.61	100.00
Total	345	100.00	

Method of Enrolment into T4A Intervention

The study aimed to determine whether respondents joined voluntarily. Results reveal that 82.30% willingly signed up, while 16.21% were influenced by a healthcare worker to enroll. This finding establishes that enrollment into T4A was voluntary for a majority of respondents and is line with Olgin. *et al*. 2017, Salomon, 2004, Reamer, 2013, and Rhea, 2012) who suggest "emerging technologies allow for recruitment of participants purely online." The results are highlighted in Table 6.

Table 6: How did you enroll?

	Freq.	%	cum
I enrolled voluntarily	284	82.30	82.30
I was persuaded by a health worker	56	16.21	98.51
I enrolled under peer pressure	5	1.49	100
Total	**345**	**100.00**	

T4A method of recruitment is consistent with other studies. For instance, Campbell (2016), used "practitioner-led recruitment through Maternal and Child Health nurses, midwives, and nurses in general practice; face-to-face recruitment by researchers; and online recruitment" and social workers (Beckwith, G et al). T4A however did not utilize an online recruitment without human intermediaries.

Hypothesis Testing

Objective of the study involved testing the following null hypothesis:

H_0:There is no significant relationship between voluntary participation and communication among PLHIV in Siaya, Kenya

Hypothesis two: $Y= \beta_0 + \beta_2 X_2 + \varepsilon$

Where Y= communication outcomes

$\beta 0$ = The intercept

β_2= Regression coefficients shows the change in the value of Y from a unit change in X

X_2= voluntary participation

ε = Random error

Results indicate voluntary participation had significant influence on the communication, p-value = 0.0038, CI=95%. This finding provides strong evidence to reject the null hypothesis thus accept the alternative hypothesis that "There is significant relationship between voluntary participation and communication among PLHIV in Siaya, Kenya". This suggests that as long as one was enrolled they benefitted from the T4A mhealth intervention and had improved health outcomes irrespective of whether they voluntarily enrolled or not. Details are in Table 7.

Table 7: Voluntary Participation and Communication Outcome

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.942	2	1.471	3.300	.038
	Residual	152.443	342	0.446		
	Total	155.385	344			

a. Dependent Variable: Zscore: In the last one year, how many appointments did you honour at the clinic?
\b. Predictors: (Constant), Zscore: Were you given a provision for withdrawal from the system at any stage?, Zscore: How did you enroll?

The coefficients of the disaggregated sub-variables of voluntary participation indicated how individuals enrolled (whether in private or public) (p value = 0.016, CI=95%) had significant influence on communication and whether they were given the provision to withdraw (p value = 0.160, CI=95%) did not have a significant influence on communication as highlighted in Table 8.

Table 8: Coefficients of Disaggregated Voluntary Participation and Communication Outcomes

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-0.259	0.036		-7.209	0.000
	Zscore: How did you enroll?	0.090	0.037	0.133	2.421	0.016
	Zscore: Were you given a provision for withdrawal from the system at any stage?	0.052	0.037	0.078	1.410	0.160

a. Dependent Variable: Zscore: In the last one year, how many appointments did you honour at the clinic?

The study also sought to know from respondents if they perceived the T4A intervention as useful. Perceived usefulness was a moderating variable. Therefore, the moderating influence of perceived usefulness on the relationship between voluntary participation and communication was tested using the following hypothesis:

H_0: There is no significant moderating influence of perceived usefulness on the relationship between voluntary participation and communication with PLHIV in Siaya, Kenya

Hypothesis Five: $Y= \beta_0 + \beta_2 X_{2m} + \varepsilon$

Where Y= communication outcomes

$\beta 0$ = The intercept

β_2= Regression coefficients shows the change in the value of Y from a unit change in X

X_2= voluntary participation

$_m$=perceived usefulness

ε = Random error

Results indicate that voluntary participation moderated by perceived usefulness had significant influence on communication at p-value = 0.034, CI=95%., which implies that there was evidence to reject the null hypothesis hence conclusion is that there was significant moderating influence of perceived usefulness on the relationship between voluntary participation and communication with PLHIV in Siaya, Kenya. Details are indicated in Table 8.

Table 9: Voluntary Participation Moderated by Perceived Usefulness

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.882	3	1.294	2.913	.034
	Residual	151.503	341	0.444		
	Total	**155.385**	**344**			

a. Dependent Variable: Zscore: In the last one year, how many appointments did you honour at the clinic?
b. Predictors: (Constant), Zscore: Usefulness, Zscore: How did you enroll? Zscore: Were you given a provision for withdrawal from the system at any stage?

The coefficients of disaggregated sub-variables of voluntary participation, how the patients enrolled (p value 0.017, CI=95%) had significant influence on the communication and given provision to withdraw (p value 0.176, CI=95%) as well as usefulness (p value = 0.147, CI = 95%) had no significant influence on the communication as indicated in Table 10.

Table 10: Coefficients of Disaggregated Sub Variables of Voluntary Participation and Communication Outcomes

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-0.259	0.036		-7.221	0.000
	Zscore: How did you enroll?	0.089	0.037	0.132	2.407	0.017
	Zscore:Were you given a provision for withdrawal from the system at any stage?	0.050	0.037	0.075	1.355	0.176
	Zscore: Usefulness	0.052	0.036	0.078	1.455	0.147

a. Dependent Variable: Zscore: In the last one year, how many appointments did you honour at the clinic?

On the other hand, voluntary participation without the moderating variable could only predict 2% of the changes in communication and when combined with the moderating variable of perceived usefulness, voluntary participation could only predict 3% of changes in communication. Details are highlighted in Tables 11 and 12.

Table 11: Linear Regression Model Summary of Voluntary Participation and Communication

Model Summary of voluntary participation and communication without moderating variable				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
	.138	0.019	0.013	0.668

a. Predictors: (Constant), Zscore: Were you given a provision for withdrawal from the system at any stage? Zscore: How did you enroll?

Table 12: Model Summary of Voluntary Participation and Communication Outcomes Moderated by Perceived Usefulness

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.158	0.025	0.016	0.667

a. Predictors: (Constant), Zscore: Usefulness, Zscore: How did you enroll?, Zscore: Were you given a provision for withdrawal from the system at any stage?

Objective of the study involved testing the following null hypothesis:

H_0:There is no significant relationship between voluntary participation and communication with PLHIV in Siaya, Kenya

Hypothesis two: $Y= \beta_0 + \beta_2 X_2 + \varepsilon$

Where Y= communication outcomes

$\beta 0$ = The intercept

β_2= Regression coefficients shows the change in the value of Y from a unit change in X

X_2= voluntary participation

ε = Random error

Voluntary participation had significant influence on the communication, p-value = 0.0038, CI=95%. The finding provides strong evidence to reject the null hypothesis thus accept the alternative hypothesis. It is evident that there is significant relationship between voluntary participation and communication with PLHIV in Siaya, Kenya. This suggests that whether one volunteered to participate or not, as long as they were enrolled, they benefitted from the T4A mhealth intervention and had improved communication/health outcomes.

Table 13: Voluntary Participation and Communication Outcome

ANOVA[a]						
Model		**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
1	Regression	2.942	2	1.471	3.300	.038
	Residual	152.443	342	0.446		
	Total	155.385	344			

a. Dependent Variable: Zscore: In the last one year, how many appointments did you honour at the clinic?
b. Predictors: (Constant), Zscore: Were you given a provision for withdrawal from the system at any stage?, Zscore: How did you enroll?

A Pearson's correlation of voluntary enrollment was performed and returned (r= 0.125. p>0.05), meaning an increase in voluntary enrolment onto mhealth intervention increases general wellness of PLHIV. On the other hand, voluntary participation (r= -0.0662. p>0.05) was negatively associated with not signing of consent forms at the time of enrolment as shown in Table 14 and 15.

Table 14: Pearson's Correlation on Voluntary Enrollments with Wellness

	Wellness
voluntary enrollment	0.125
Significance	0.00

Table 15: Pearson's Correlation on Voluntary Participation with Signing of Consent Forms

	Consent Forms Not Signed
Voluntary Participation	**-0.0662**
Significance	0.00

A logistic regression was also performed on voluntary participation in relation to honouring appointments, which returned a z=0.25, suggesting a good relationship but not significant.

Table 16: Logistic Regression Results

1. Dependent Variable = 1 if appointment were honoured and zero otherwise

Logistic regression	Number of obs	=	317
	LR chi2(17)	=	49.92
	Prob > chi2	=	0
Log likelihood = -166.87	Pseudo R2	=	0.13

Outofthetotalappointmentsla3	**Odds Ratio**	**Std. Err.**	**z**	**P>z**	**[95% Conf.**	**Interval]**
Didthesystemsupporterdisclos	1.11	0.79	0.15	0.88	0.28	4.45
Didyousignaformofconsentb	1.69	0.66	1.34	0.18	0.78	3.63
Wereyougivenaprovisionforw2	0.21	0.11	-3.00	0.00	0.08	0.58
Wereyoucomfortablewhenyouwe2	0.15	0.21	-1.37	0.17	0.01	2.26
Voluntary_enrolment	1.12	0.53	0.25	0.80	0.45	2.84
Didyoufeeltheenvironmentund2	2.62	3.56	0.71	0.48	0.18	37.80
Isyourphonepasswordprotected2	0.38	0.12	-3.15	0.00	0.21	0.70
Whoenrolledyou2_HW	2.02	1.46	0.98	0.33	0.49	8.29
Wouldsomebodyelseseeingyour2	0.79	0.24	-0.78	0.44	0.43	1.44
Health_Improved	0.87	0.44	-0.28	0.78	0.32	2.34
Usefulness	0.95	0.12	-0.41	0.69	0.74	1.22
Wherewereyouenrolled_private	2.91	1.88	1.65	0.10	0.82	10.33
Gender2	0.76	0.22	-0.93	0.35	0.43	1.35
MaritalStatus2	1.26	0.24	1.26	0.21	0.88	1.82
LevelofEducation2	0.99	0.17	-0.03	0.97	0.72	1.38
EmploymentType2	1.68	0.51	1.69	0.09	0.92	3.06
Incomelevel2	1.11	0.25	0.47	0.64	0.71	1.74
_constant	2.50	3.74	0.61	0.54	0.13	46.79

Discussion

The goal of this research was to examine the impact of voluntary engagement in communicating with PLHIV in Siaya, Kenya. Results show that 82.32% confirmed voluntary enrollment, while 67.59% of respondents reported signing a consent form. Further, the findings show that a majority at 77.39% stated that they were informed of their right to withdraw from the system at any stage while 22.61% stated otherwise. On acceptance to receive SMS messages, 89.6% said that they had agreed. The finding that the requirement for withdrawal from participation or enrollment from T4A was known by the majority of the respondents is supported by Marimba, et al (2023) citing Marshall, Adebamowo, Adeyemo, *et al* (2014).

The study findings also established that voluntary participation did not have a significant relationship with communication. This finding suggests the patients trusted the healthcare provider fully. Correlations on voluntary enrollment/participation, with regard to wellness', returned a z=0.125 (Table 14), while voluntary participation (r=-0.0662. p>0.05) (Table 15) was negatively associated with not signing of consent forms at the time of enrollment. Therefore, T4A to a great extent ensured that those PLHIV who enrolled on the system did so voluntarily

Furthermore, Voluntary participation moderated by perceived usefulness had significant influence on communication at p-value = 0.034, CI=95% (table 9). This means that there was evidence to reject the null hypothesis and conclude that there was

significant moderating influence of perceived usefulness on the relationship between voluntary participation and communication among PLHIV in Siaya, Kenya.

Previous studies (Dillingham, Ingersoll, Flickinger, Waldman, Grabowski, Laurence, et al., 2018, Schooler, M. *et al.* 2018, Kostera, E, et al, 2019, Cooper, V., Clatworthy, J., Whetham, J et al, 2017) support the use of mhealth apps interventions in improving health outcomes of patients suffering from chronic illnesses. Thus, "mobile health interventions can positively influence the continuity of care and medical results for susceptible individuals living with HIV... improvements in engagement strategies have displayed potential... increased phone communication between clinic visits and engagement of peer mentors or coaches have demonstrated the ability to decrease missed appointment rates" (Laurence, C et al., 2018). This underscores the importance of text messaging to communicate to patients to remind them of taking medications or when they are due for their next visit to see their doctor. Duthely, Sanchez-Covarrubias, Mohamed, Potter (2020) also concluded that 'mobile health (mHealth) solutions are supportive in improving HIV health care outcomes'.

Further, Anthony, Molokwu, Alozie & Magallanes (2019) also support use of mhealth interventions in improving adherence to medications and honouring a doctor's appointments. Anthony, et al "found a statistically significant reduction in our no-show rates (individuals failing to keep scheduled appointments) of 24.8% versus 17.7%, *P* value .05." Keeping medi-appointments is important for HIV patients for doctors to review their viral status and adjust medication if need be and generally appraise the patients' general health. Skipped appointments because of forgetting can have negative repercussions for patients. This finding is further reinforced by Sánchez, Ramay, Zook, de Leon, Peralta, Juarez & Cocohoba (2021), who also found a "small but significant mean improvement in adherence over the six-month period (4%, $P<.01$) and that text message interventions effectively support antiretroviral adherence in pendiatric patients living with human immunodeficiency virus". These ARVs mean getting HIV is no longer a death sentence.

SMS texts are important for reminding the PLHIV to take their medications as scheduled. Furthermore, Yang and Van Stee (2019), also observe that "mHealth interventions are relatively more effective than comparison interventions or conditions, with a small but significant overall weighted effect size (Cohen d=0.31)". Additional empirical literature on mhealth interventions by Ghani, Jarl, Sanmartin Berglund, Andersson & Anderber (2020) also found "limited evidence of cost-effectiveness to support use of mhealth interventions, [especially] related to "simple text-based communications" and finally, Wirsiy, Ako-Arrey, Njukeng (2019) review revealed that using SMS elicited " behavioural actions as well as improved treatment adherence in women patients in Cameroon".

5.0 CONCLUSION AND RECOMMENDATIONS

Conclusion

This study has established that T4A met the requirement for voluntary participation with 82.32% signifying that they enrolled voluntarily and 67.59% of the respondents' said that they had signed a consent form. Further, T4A mobile health intervention/solution and supported by other studies has demonstrated that there are improved health outcomes for PLHIV and which holds true for other LONG TERM medical conditions. The study also suggests that whereas it is important to secure informed consent of patients before enrollments, the app itself need to be improved to allow for consent before enrollment can proceed. HIV like other contagious diseases is a global public health challenge and requirement for consent need to be reviewed against the anticipated health benefits as a matter of public health policy. No government in

the world would allow its citizens to die from any disease if options to make them productive and prolong their lives are available. mhealth interventions are therefore urgent for PLHIV and other illnesses.

Recommendations

This study and others in the mhealth space have established that there are benefits in supporting patients to take medication as prescribed and attending clinics as scheduled through text messaging. There is therefore a need for scaling up enrolment in counties and countries with high HIV prevalence especially in Sub -Sahara Africa, Asia and the pacific which together bears about 82% of the global HIV burden. The cost of upscaling enrollment, should not be left to private sector developers or non -governmental organizations. Governments should take it up as a matter of public health promotion and make resources available. In addition, since mhealth and telemedicine is set to grow even bigger, future mobile Apps interventions across the spectrum should have an option to accept all the terms including consenting before proceeding with the enrollment. If a patient declines to accept the online consent, the system would automatically prevent progression to the next stage. Mass education campaigns on the benefits of mhealth interventions could also precede large scale recruitment programmes.

The current study used a descriptive design. Future research, scholars and academia could use qualitative research approaches like ethnography in order to delve deeper into the issues informing high HIV prevalence in the lake region counties and why HIV prevalence is high among the married.

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