DETERMINANTS OF HIV SELF-TESTING UTILIZATION AMONG HEALTH SCIENCES UNDERGRADUATE STUDENTS; A BINARY LOGISTIC REGRESSION APPROACH

NICHOLAS KYALO MUENDO (M.B.Ch. B)

W62/34686/2019

MAIL: nickkmuendo@gmail.com

A THESIS SUBMITTED TO THE DEPARTMENT OF PUBLIC AND GLOBAL HEALTH IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF MEDICAL STATISTICS OF THE UNIVERSITY OF NAIROBI

Declaration of Originality Form

Name of student..... Nicholas Kyalo Muendo

Registration number W62/34686/2019

Faculty ..... Health Sciences

Department..... Public and Global Health

Course name..... Master of Medical Statistics

Title of the work…… Determinants of HIV self-testing utilization among health sciences undergraduate students; A binary logistic regression approach.

Declaration

1. I understand what plagiarism is and I am aware of the University's policy in this regard.
2. I declare that this thesis is my original work and has not been submitted elsewhere for examination, award of degree or publication. Where other people's work or my own has been used, this has properly been acknowledged and referenced in accordance with the University of Nairobi's requirements.
3. I have not sought or used the services of any professional agencies to produce this work.
4. I have not allowed and shall not allow anyone to copy my work with the intention of passing it off as his/her own work.
5. I understand that any false claim in respect of this work shall result in disciplinary action, in accordance with the University plagiarism policy.

Signature……. **Date: 30th October 2023**

Supervisors' Declaration

This thesis has been submitted to the University with our approval as supervisors.

Dr. Peninah Masibo
Global Programs for Research and Training, Affiliate of the University of California San Francisco (UCSF) & Adjunct Lecturer, University of Nairobi, Department of Public and Global Health
Email: peninahmasibo@gmail.com

Cell. +254721952175

Signature……. **31st October 2023**
Date……

Dr. George Muhua

Lecturer, University of Nairobi, Department of Mathematics

Email**: muhuageorge@gmail.com**
Cell. +254722834665

2nd November 2023

---------- ----------

Signature **Date**

Acknowledgement

Foremost, I give thanks to God the Almighty, the fountain of wisdom and grace. His immeasurable mercy, divine power, and unwavering love have sustained me through life's journey, enabling me to be alive and in sound health throughout this academic pursuit. His blessings have been my steadfast anchor, enriching every step of my odyssey.

I extend my profound appreciation to Dr. Duffton Mwaengo, former Director at the Institute of Tropical and Infectious Diseases, University of Nairobi (UNITID). His persuasive counsel became the impetus that convinced me to embark on this course.

Special acknowledgement goes to the University of Nairobi, particularly the Department of Public and Global Health and the Department of Mathematics. Their unwavering support, rich resources, and conducive learning environment were instrumental in making this scholarly work possible.

To my esteemed supervisors, Dr. Peninah Masibo and Dr. George Muhua, my heart swells with gratitude for your outstanding commitment, invaluable guidance, and continuous encouragement. Your professional and academic insights and dedication have been pivotal in moulding this thesis into a reality.

Heartfelt appreciation is extended to my classmates, Robert Ofwete, Peninah Wangari, and Maryanne Odhiambo. Your camaraderie, team spirit, and constant encouragement were the bedrock of our mutual support system, helping us weather the storms and celebrate the successes throughout this journey.

I owe a debt of gratitude to my research assistant, Dr. Stephanie Ondego, and all the undergraduate students from the University of Nairobi, Faculty of Health Sciences. Their participation and contributions were fundamental cornerstones that gave life and substance to this study.

Lastly, my profound gratitude to my parents, family, and friends who have been my bulwark of support. Their prayers, kind words, and endless encouragement became my oasis of hope and strength, especially in moments of despair and exhaustion.

Each of you holds a special place in this achievement, and in my heart, for making this journey not just possible, but profoundly enriching. Thank you.

Dedication

To my beloved parents,

Engineer Pius Muendo Munyao and Agnes Mueni Muendo,

Your unending love and indomitable spirit of sacrifice have illuminated every step of my educational journey. It was your hands that first planted within me the seed of education, discipline, and unwavering hard work. You taught me that the sky, in all its vastness, is merely the beginning - a bare minimum, urging me to reach beyond and redefine limits.

In moments of doubt, your continuous prayers and uplifting words of encouragement became the wind beneath my wings, propelling me forward. Your faith in my capabilities, even when I wavered, was a beacon that dispelled the shadows of uncertainty.

I am, and will always remain, eternally indebted to the both of you. Your legacy will forever echo in the corridors of my heart and mind. For all you have done and continue to do, I cherish and hold you dear. Thank you, forever grateful.

Table of contents

Table of Figures

List of Figures

List of abbreviations and acronyms

ABC	-	Abstinence, Be faithful, Condom use
AIDS	-	Acquired Immune Deficiency Syndrome
HAART	-	Highly active antiretroviral therapy
HIV	-	Human Immunodeficiency Virus
HIVST	-	Human Immunodeficiency Virus Self Testing
HTC	-	HIV Testing and Counselling
KENPHIA	-	Kenya Population-based HIV Impact Assessment
KNH	-	Kenyatta National Hospital
LVCT	-	Liverpool VCT Care and Treatment
MSM	-	Males who have sex with males.
MBCHB	-	Bachelor of Medicine & Bachelor of Surgery
NASCOP	-	National AIDS and STI Control Program
PrEP	-	Pre-exposure prophylaxis
STI	-	Sexually Transmitted Infection
UoN	-	University of Nairobi
UNAIDS	-	The Joint United Nations Program on HIV/AIDS
VCT	-	Voluntary Counselling and Testing
VMMC	-	Voluntary medical male circumcision
WHO	-	World Health Organization

Definition of operation terms

HIV: Human Immunodeficiency Virus. This is the virus that causes Acquired Immune Deficiency Syndrome (AIDS). The human immunodeficiency virus (HIV) targets cells of the immune system, called CD4 cells, which help the body respond to infection. Within the CD4 cell,HIV replicates and in turn, damages and destroys the cell. If highly active antiretroviral therapy (HAART) is not initiated, HIV can lead to the disease, AIDS.

AIDS: is a term that applies to the most advanced stages of HIV infection. It is defined by the occurrence of any opportunistic infections, so named because they take advantage of a weakened immune system. AIDS is an HIV infection with either a CD4+ T cell count below 200 cells per μL, or the occurrence of specific diseases associated with HIV infection.

CD4 Cells: are a type of T cell that play an important role in the immune system, particularly in the adaptive immune system. They help in the activity of other immune cells by releasing cytokines, small protein mediators that alter the behavior of target cells that express receptors for those cytokines.

Cross generation sex: This is when female students engage in sex with men who are older, financially stable and can offer incentives.

HIV self-testing (HIVST): is the process by which a person collects his or her own specimen (oral fluid or blood) to perform an HIV diagnostic test. He/she then interprets the result, either in private or in the company of someone they trust. Rapid test kits, such as finger stick tests (on whole blood) or mouth swab tests (on oral-fluid) are used to conduct these tests. HIVST does notprovide a diagnosis. Negative self-test results are considered negative, but all positive self-test

results need to be confirmed according to national algorithms as laid out by Ministry of Health Kenya.

OraQuick®: is the first FDA-approved oral swab in-home test for HIV-1 and HIV-2. It's an oral swab test that doesn't require blood. It's completely private.

INSTI®: is a qualitative immunoassay that uses blood to detect HIV-1 and HIV-2 antibodies. The test uses simple flow-through technology to detect HIV-1 and HIV-2 antibodies using a dropof human finger stick blood. The test is intended for use by untrained lay users as a self-test to aidin the diagnosis of HIV-1 and HIV-2 infection using a small drop (50µL) of blood obtained through finger stick collection procedures.

Unassisted HIV self-testing: Refers to an individual obtaining a kit for HIV self-testing and performing the HIV test following the instructions in the insert provided by the manufacturer.

Directly assisted HIV self-testing: Refers to when individuals who are performing a self-test for HIV receive an in-person demonstration from a trained provider or peer before or during HIVST with instructions on how to perform a self-test and how to interpret the self-test result. This assistance is provided in addition to the manufacturer-supplied instructions for use and other materials found inside HIVST kits.

Provider-Initiated HIV Testing & Counseling (PITC): refers to HIV testing and counseling which is routinely recommended by health care providers to persons attending health carefacilities as a standard component of medical care. With this approach, an HIV test is recommended for all patients whose clinical presentation might result from underlying HIV infection or as a standard part of medical care for all patients attending health facilities in areasof high HIV prevalence.

Client-Initiated HIV testing and counseling (CITC) / Voluntary Counselling and Testing: individuals seek HIV testing and counseling services on their own initiative. It is individualized client-centered counseling.

Service provider: In the context of HIVST is an organization, business or individual which offers service to others either for free or on payment of a fee.

Vendor: In the context of HIVST is an outlet which sells directly to the consumer e.g. chemists.

Abstract

Background.

In 2016, the WHO issued guidance on HIV self-testing as a measure to improve the access and uptake of HIV diagnosis towards curbing the increasingly growing HIV incidences and progression to AIDS. The Kenya HIV Impact Assessment released in January 2020 estimated HIV prevalence of 4.9 percent and 36,000 annual infections (KENPHIA, 2018). The prevalence of HIV by sex and age showed higher rates among women and those aged 20 to 34 years.Numerous studies have applied logistic regression approach to enhance the knowledge and statistics on HIV/AIDS among college-going students (Shahzad et al., 2021). The present study sought to advance knowledge of HIV among faculty of health sciences undergraduate students by assessing determinants affecting the utility of HIV self-testing kits. Contrary to previous studies, this study applied a multilevel model approach to generate both fixed (overall average) estimates and investigate the random (course and year-of-study specific estimates) effects.

Broad Objective.

To assess the determinants of HIV self-testing utilization among undergraduate students in the Faculty of Health Science, University of Nairobi.

Methodology.

Study design – The study was a cross-sectional analytical study. It was conducted at the UoN Chiromo and KNH campuses, which are 2 and 3 kilometers north & southwest of Nairobi, the capital city of Kenya. The study participants included undergraduate medical students from the University of Nairobi, Faculty of Health Sciences undertaking bachelor's degree in MBChB, Pharmacy, Nursing, Dentistry and Medical Laboratory Sciences. Data collection was done using self-administered questionnaires. The variables to be assessed included HIVST uptake (dependent variable), socio-demographic factors (age, sex, marital status, religion, residence) individual factors (knowledge about HIV, sexual behavior factors, stigma, media exposure, affordability of self-test kits) and institutional factors (accessibility to healthcare facilities, availability of HIVST). Data analysis was performed using R software version 4.2.3 (2022-10-31 UCRT)

Significance of the study.

The research provided useful information about predictors of HIV self-testing utilization, including its barriers and facilitators. It also demonstrated the levels of self-awareness of HIVserological status amongst the youthful population.

Results

The study revealed an overall HIVST utilization rate of 30.5% among participants. Marital status was found to be a significant determinant, with married students being 9.22 times more likely to use HIVST compared to their single counterparts (p-value = 0.049). Conversely, practicing safe sex, longer time since the last HIV test, and concerns about potential reactions were associated with lower odds of HIVST utilization.

Conclusion

The study revealed an overall HIVST utilization rate of 30.5% among participants. Marital status was found to be a significant determinant, with married students being 9.22 times more likely to use HIVST compared to their single counterparts (p-value = 0.049). Conversely, practicing safe sex, longer time since the last HIV test, and concerns about potential reactions were associated with lower odds of HIVST utilization.

CHAPTER I
INTRODUCTION

1.1 Background

In 2016, the WHO issued guidance on HIV self-testing as a measure to improve the access and uptake of HIV diagnosis towards curbing the increasingly growing HIV incidences and progression to AIDS. There are roughly 37.7 million persons living with HIV/AIDS, with 2.5 million of these being newly acquired infections and 28.2 million receiving highly active antiretroviral therapy (HAART) (Paredes *et al.*, 2022). The youth group aged 14-25 years-old have been shown to be highly predisposed to HIV/AIDS, constituting 45% of the global incidences (KENPHIA, 2018). This is especially true for students at tertiary level of education, due to their risky sexual behavior including cross generational sex among female students (Ndabarora and Mchunu, 2014a). However, testing of HIV and linkage to HIV care among this age-group remains abysmally low (Obiezu-Umeh *et al.*, 2021).

The Kenya HIV Impact Assessment released in January 2020 estimated HIV prevalence of 4.9 percent and 36000 annual infections (KENPHIA, 2018). The HIV prevalence by sex and age showed higher statistics among women and those aged 20 to 34 years. This age group includes mostly undergraduate university students, especially females who are highly predisposed (Carin, A.A. & Sund, 2018). To mitigate the rising HIV/AIDS prevalence among the youths, HIV prevention programs including HIV Testing and Counselling (HTC) have been implemented in nearly all tertiary institutions in Kenya (Nyarondia, Ongong'a and Omolo, 2014).

HIV self-testing (HIVST) involves an individual privately obtaining a specimen, carrying out HIV test, and interpreting results of the test ('Kenya ARV Guidelines', 2022). The approach is widely accepted because of its affordability, accessibility and privacy (Johnson *et al.*, 2014). Thisincreases access to HIV testing services in high-risk populations, therefore contributing to the

2030 95–percent global agenda (UNAIDS, 2013). The *"Chukua Selfie"* program, a Kenyan- based self-testing campaign aimed at improving HIV awareness and sensitization among the youths (Okewo, 2021). The approved test kits include ORAQUICK® and INSTI®, free of cost in government facilities (NASCOP, 2019).

The use of logistic regression to improve understanding on epidemiology of diseases has become popular (Shipe *et al.*, 2019). Numerous studies have applied logistic regression approach to enhance the knowledge and statistics on HIV/AIDS among college-going students (Shahzad *et al.*, 2021). For instance, Badenhorstc et al (2008) carried out research on risk factors of HIV/AIDS among students at the University of Free State using logistic regression. Paulina (2019), on the other hand, applied a logistic regression approach to model the enablers and barriers to HTC among the college of health sciences undergraduate students in Kenya. Applying fixed effects models, these studies provide essential statistics on HIV among the college students and offer good insights into the factors affecting HIV counselling and testing uptake in this population.

Present study sought to advance the knowledge of HIV among faculty of health sciences undergraduate students by assessing factors affecting the utility of HIV self-testing kits. Contrary to previous studies, the present study applied a multilevel model approach to generate both fixed (overall average) estimates and investigate the random (course and year-of-study specific estimates) effects. This offered a platform for understanding differences in HIVST based on the course type (between-group) and knowledge base/level of study (within-group).

1.2 Statement of the problem

Globally it is estimated that 11.8 million youths aged 15 to 24 years live with HIV / AIDS and only a minority of these know they are infected (National AIDS Control Council, 2018). There was a 46% decline in new HIV infections among young people (15–24 years) from 2000 to 2019.

In 2019, two out of every seven new HIV infections globally were among young people (15–24

years) (UNAIDS, 2021). Young people between the ages of 15-24 years contribute 13% of the total number of HIV infections in Kenya (among 15-49-year old's) according a report titled, "*Unintended Pregnancies and HIV among Adolescents and Young People Report by Unicef*" (Samuels *et al.*, 2020)

Undergraduate students in Kenyan institutions of higher learning range in age from 18 to 24 years. Students in colleges and universities are an important and susceptible population for a number of reasons, including high levels of sexual activity, an increasing incidence of risky sexual behaviors, and a poor assessment of their own risk for HIV infection (Ayodele, 2017). There were 184,719 HIV-positive people in Kenya between the ages of fifteen and twenty-four, accounting for 12 percent of the overall population of HIV-positive people (National AIDS Control Council, 2018). Lower rates of diagnosis of HIV and commencement of treatment amongst young people aged 15 to 24 years and adolescent poses a serious barrier to HIV pandemic control. With a 'business as usual' approach to HIV testing and treatment, new acquired infections in this group are projected to increase, exacerbated by Africa's growing youth population, which is expected to hit293 million by the year 2025 (Wong *et al.*, 2017).

In most institutions of higher learning, the efforts to raise awareness about HIV and AIDS arestill focused on the brief induction span at the beginning of every academic year for new students joining first year. This poses a problem as most Kenyan university students come from diverse cultures and social backgrounds therefore their susceptibility and vulnerability to HIV/AIDS and other sexually transmitted diseases may differ (Reddy and Frantz, 2011).

Additional efforts are required to address the structural factors that increase the vulnerability of adolescent girls, young women, and young key populations and their risk of contracting HIV (UNAIDS, 2021). Most government health facilities and some private health facilities in Kenya offer free HIV self-testing kits, albeit HIV self-testing being underutilized in the country (USAID

and EPiC, 2021). HIV / AIDS awareness in the general population is very high, but the uptake and utilization of HIVST does not match the effort of government and relevant stakeholders. The knowledge is even higher among university students (Oppong Asante and Oti-Boadi, 2013).

This study targets undergraduate university students (in the 15–24-year age bracket) who account for 13 percent of all new HIV infections in Kenya.

1.3 Justification of the study

HIVST can be a low-cost high-impact intervention method to reach groups of people who are not testing, and this can raise the population of persons living with HIV being diagnosed and being started on HAART. This self-testing can also provide an opportunity to link those who test negative with HIV prevention services (UNAIDS, 2021).

The main objective of this research was to deduce the predictors of HIV self-testing services among University of Nairobi faculty of health sciences undergraduate students. Previous studies have used ordinary logistic regression models to identify factors influencing the utility of HIVST among youth, not taking into account the clustered nature of data used (Kulkarni *et al.*, 2013; Workie *et al.*, 2017; Wandera, Kwagala and Maniragaba, 2020; Ahmadi *et al.*, 2021). In this study, a mixed- effects logistic regression model was applied to account for clustering within courses and levels of study.

Studying and finding out the predictors helped identify the barriers and facilitators associated with HIV self-testing especially among the youths. It also encouraged and motivated UON undergraduate students to actively test themselves for HIV using new emerging testing modalities privately at the comfort of their hostel rooms and at home. It also aimed at boosting the HIV prevention campaign targeted on the students and generally youth in the country by the university of Nairobi administration together with ministry of health Kenya and its affiliate partners. The setting of the study was at the University of Nairobi KNH and Chiromo campus which had sizeable youthful Health Sciences student population.

1.4 Research question

Are the determinants of HIVST utilization uniform across all undergraduate students in the University of Nairobi, Faculty of Health Sciences?

1.5 Objectives

1.5.1 Broad objective

To assess the determinants of HIV self-testing utilization among undergraduate students in the Faculty of Health Science, University of Nairobi.

1.5.2 Specific objectives

i. To determine the overall frequency of use of HIVST among the undergraduate students of UoN-FHS.

ii. To determine strength and significance of variations in HIVST across course-type and year-of-study among the undergraduate students of UoN-FHS

iii. To assess the socio-demographic, individual and institutional factors associated with the use of HIVST among the undergraduate students of UoN-FHS.

CHAPTER II
LITERATURE REVIEW

2.1 Introduction

This chapter analyzed the available literature on the subject comprising of findings by other researchers from related studies.

2.2 Overview of self-testing for Human Immunodeficiency Virus

HIVST is a procedure in which an individual obtains a sample from his body which can be saliva or blood, carries out a test for HIV and privately interprets the results (NASCOP, 2019). Self-testing for HIV is a screening test that does not give a final HIV-positive diagnosis. An individual who gets a negative result is advised to repeat the test in three months if in the preceding three months they had engaged in risky sexual behaviors like having unprotected sex. All reactive (positive) self-test results have to be confirmed by a qualified healthcare provider byusing the national testing algorithm from the Ministry of Health ('Kenya ARV Guidelines', 2022). Self-testing for the human immunodeficiency virus is supplementary to established HIV testing programs. It is a high impact and low-cost intervention that can reach populations that are not testing and can increase the proportion of HIV – positive people who aren't diagnosed (Figueroa *et al.*, 2015). In government-owned health facilities, HIV self-test kits are usually distributed at no cost to sexual partners of all clients presenting at antenatal and postnatal care,tuberculosis/sexually transmitted infection (TB/STI) and family planning clinics, among other entry points. It is also recommended as a strategy to target men, key populations, and young people (aged 15 to 25 years) with special consideration to adolescents (aged 15 to 17 years) who conduct self-test with the assistance of a qualified health provider (NASCOP, 2019).

The guiding principles of HTS include acceptance, confidentiality, advice, correct findings and linkage(NASCOP, 2019). The uptake of HIVST has however been faced with challenges such as a perceived lack of risk of HIV, fear of a positive test, stigma and discrimination, attitudes of healthcare providers and insufficient access (Njau *et al.*, 2019).

In Kenya, HIV testing is available to the general populace for free at public health institutions, private healthcare facilities, pharmacies, and online e-pharmacy stores, where kits cost between Ksh. 250 and Ksh. 500. (NASCOP, 2019). Some of the types of HIVST kits permitted to be used in Kenya are INSTI (bioLytical Laboratories, Canada), INSTI HIV Self-Test (Pouch), OraQuick HIV Self-Test (OraSure Technologies, USA), and the Atomo HIV Self-Test (Atomo Diagnostics, Australia).

2.3 Socio-demographic factors associated with HIVST

A study by Mugambi et al showed that participants aged 20–29 years were more likely to use HIVST kits, while those aged 50 and older were less likely to self-test. A study conducted in Malawi revealed a similar pattern of declining HIVST utilization across older age groups. This was potentially attributable to the younger population's accessibility to health centers, where HIVST are distributed (Mwangi *et al.*, 2022).

HIVST has been observed to be higher in child-bearing women compared to women without children. This is contrary to men, where no association was found with marital status (Mwangi *et al.*, 2022). The male gender, married or cohabiting civil status are more likely to use home- based HIVST over facility-based (Tonen-Wolyec *et al.*, 2020).

2.4 Individual Factors

2.4.1 Ease of using HIVST kit

Majority of youths are unaware of HIV self-testing (HIVST), specifically the oral-based self-testing kit, negatively affecting the uptake rate within this age category (Mwangi *et al.*, 2022). Despite this, utilization of HIVST kit is high among the youth since it reduces the stigma and discrimination associated with health-care testing. Accessibility and timing are equally considered as crucial deciding factors for utilizing the HIVST kit as opposed to facility-based testing, with youths emphasizing the possibility to do the HIV test in the comfort of one's own home, hence saving time and avoiding long wait times (Obiezu-Umeh *et al.*, 2021).

2.4.2 Perceived benefit of testing

The intention of students to undergo HIV testing is impacted by their perceptions of the social and psychological barriers involved with HIV testing, as well as opinions about the positive and negative personal repercussions of HIV testing (Ayodele, 2017).

2.4.3 Lack of post-test counselling

A few youths who have had mixed reactions towards HIVST reported the absence of post-test counselling or follow-up care as a major concern because they believe it can lead to suicide or self-harm after learning the results (Obiezu-Umeh *et al.*, 2021).

2.4.4 Preference of blood-based HIV tests

Due to fear of pain and discomfort from the needle prick, most participants prefer when HIVST is administered orally over the blood-based HIV test. Alternately, others choose to test at the clinic because they feel the blood-based HIV test yields more accurate results. A minority of the youths' express concern with the HIVST kit's inability to be utilized and interpreted without error or unwanted effects (Obiezu-Umeh *et al.*, 2021).

2.4.5 Discrimination and Stigma associated with HIV testing.

Potential HIVST users regard it as having the ability to reduce the discrimination and stigma that is associated with testing of HIV, which encourages youths to utilize HIVST services. Hence HIVST enables people to check their HIV status without having to go to a health facility, leading to increased uptake (Choko *et al.*, 2017).

2.4.6 Perceived convenience of self-testing

One advantage of self-testing (at a private place or at home) is seen as a possible facilitator of self-testing. HIVST is thought to bring testing services closer to its consumers, reduce waiting time at health institutions, reducing travel expenses and freeing up time for other activities that generate income, and all this can improve HIVST uptake (Jennings *et al.*, 2017)

2.5 Institutional Factors

2.5.1 Testing instructions

Youths value a variety of channels for accessing HIV test-related information, including a step-by-step guidance on how to conduct the test and pre- and post-test counselling resources. The different modes include online video training on how to use the HIVST kit and culturally- adapted booklets with graphic images, cartoons, and brief texts translated into understandable languages (Obiezu-Umeh *et al.*, 2021).

2.5.2 Testing experience

Majority of young people who have previously been tested for HIV, reported their past testing encounters and the attitudes of healthcare personnel as a significant barrier compared to hospital-based testing, and hence prefer the oral HIVST kit. For others, the absence of empathy between the tester and the patient, as well as the fear of test result manipulation at health facilities due to a lack of provider-patient relationship and trust, are crucial variables that determine HIV testing choices.

For individuals who have never been tested, the most frequently mentioned reason for choosing the oral HIVST is the risk of cross-infection associated with the re-use of disposable needles during blood-based HIV testing at standard testing sites (Obiezu-Umeh *et al.*, 2021)

2.5.3 Continuing care and support

Most youths prefer receiving post-test counselling from a younger health worker and an easy - to - access toll-free helpline number for follow-up questions and referrals to the nearest health facility to be linked to appropriate care and support. Motivations to seek a confirmatory HIV test following a positive HIVST result include encouragement from peers, family members, or healthcare professionals, denial about the initial test result, dissatisfaction with the test result, andthe prospect of living longer under treatment and care (Obiezu-Umeh *et al.*, 2021).

2.5.4 Acceptability and affordability of HIVST

Individual motivation to conduct HIV testing is the most significant element impacting the acceptability of HIVST. The confidentiality of the HIVST has been shown to be the most important factor in adolescents' acceptance of the test, followed by its ease of use and quick findings. After using the self-test, the rate of acceptability to disseminate HIVST to others increases (Tonen-Wolyec *et al.*, 2019). The ability to afford the self-test kits is equally an essential factor. The expensive cost of purchasing self-testing kits for potential HIVST users, especially youths, may be a factor that may inhibit HIV testing (Jennings *et al.*, 2017).

2.5.5 Confidentiality of HIVST test results

In comparison with traditional HIV testing methods (i.e. mobile counseling and testing, provider-initiated counseling and testing, voluntary counseling and testing, etc.), HIVST has the ability to improve the confidentiality of HIV test findings (Makusha *et al.*, 2015) .

2.5.6 HIVST Availability and Location access

Private, registered pharmacies, youth-friendly centers, supermarkets, and online retailers are the most frequently mentioned sites for obtaining HIVST kits. In general, most young peopleassociate public and government-owned facilities with less reliable HIV test results and low- quality while private health facilities are associated with more accurate HIV test results and high-quality settings (Obiezu-Umeh *et al.*, 2021).

2.6 Previous studies on the factors influencing HIVST utilization

2.6.1 Use of multivariable logistic regression models to identify the factors influencing HIVST utilization

Previous studies have employed multivariable logistic regression models to determine the factors associated with HIVST among youths. An example is a cross-sectional study in Cambodia conducted between June and September 2017. It targeted youth older than 18 years and was done across 21 study sites in 12 provinces with a high burden of HIV and drug use. To identify the factors associated with HIVST, binary logistic regression models were run, and the variables with $p<0.05$ were subsequently used for model building. A backward stepwise selection method was used to eliminate insignificant variables with the known confounding variables added back. The results showed that sex, previous rehabilitation, access to HIV services in the past six months, education on HIV in the past three months and perception of higher HIV risk were significantly associated with HIVST. The clustering effect in the provinces and the study sites was, however, not considered during data analysis. This could have biased the results (Eng *et al.*, 2021).

Similar studies in Dominican Republic, Iran, Uganda and Nigeria, which employed clustered data, mostly from national surveys and used multivariable logistic regression models in their

analysis, did not account for clustering (Kulkarni *et al.*, 2013; Workie *et al.*, 2017; Wandera, Kwagala and Maniragaba, 2020; Ahmadi *et al.*, 2021).In cases where the outcome variable is clustered, after taking into account the effects of all explanatory variables, not making allowance for clusteringin regression analysis may bias the estimates and their precision. A hypothetical study on hearing impairment conducted in four different cities demonstrated that ignoring clustering during analysis gave misleading estimates for the regression coefficients (Ntani *et al.*, 2021). Moreover, the precision of the estimates was underestimated because of variance inflation. However, some studies which utilized multivariable logistic regression were not conducted in populations with clustering. For instance, studies in Rwanda, the United States and China were conducted in single populations with no clustering effect registered during sampling (Dzinamarira *et al.*, 2020; Morgantini *et al.*, 2020; Wu *et al.*, 2021). They, therefore, used multivariable logistic regression models to identify the determinants of HIVST.

2.6.2 Use of mixed-effects multivariable logistic regression models to identify the factors influencing HIVST utilization

A study employed data from the national South Africa Demographic and Health Survey collected in 2016 to investigate the determinants of HIVST use. The data was 2-level and hierarchical, with individuals nested within households and households nested within communities. In their analysis, household and community variables were added as randomeffects to allow for clustering within these units. They first fitted a null model with no predictor variables to show the variation of the outcome variable that is attributable to clustering. Separate multivariable models with individual, household and community predictor variables were then

fitted. A final adjusted model with factors at all levels was fitted last to assess their significance in predicting HVIST use (Awopegba, Ologunowa and Ajayi, 2021).

The Intra-Class Correlation coefficient (ICC) of 5 the models fitted was greater than 5%,indicating clustering of the outcome within the units. The study found that age, education, marriage, media exposure, sex and engaging in sexual intercourse influenced the use of HIVST (Awopegba, Ologunowa and Ajayi, 2021)

2.6.3 Use of Poisson regression models to identify the factors influencing HIVST utilization

A study in Uganda, investigating the prevalence and associated factors of HIVST among men focused on two Districts: Kampala and Mpigi. Quantitative data was collected from households within 30 villages which were located across seven sub-counties in Mpigi District. This shows that the data was hierarchical, with individuals nested within households, households nested within villages and villages nested within sub-counties. Survey-data-restricted Poisson regressionanalysis was employed to identify the factors associated with HIVST. At bivariate analysis, variables with $p<0.2$ were considered significant and added to the multivariable analysis. Those with $p<0.05$ in the multivariable analysis were considered significant (Nangendo *et al.*, 2020).

Considering that the outcome variable was binary; Yes, or No, with the outcome clustered in three levels, a mixed-effects logistic regression model would have been appropriate.

2.7 Gaps identified from literature review

The following gaps were identified from previous studies on use of HIV self-testing kits among university students.

i. There were limited studies investigating utilization of HIV self-testing kits among university students in health science departments. By focusing on this category, the study provided an opportunity to give insight and advance the knowledge on the characteristics of this untapped population.

ii. Previous studies had limited analysis on the institutional factors. By investigating institutional factors, this study informed the role of institutional factors on acquisition of HIV self-testing kits among University of Nairobi, Faculty of Health Sciences students.

iii. Previous studies had not taken account of clustering effect in their models. This failed to give a picture on cluster specific estimates and true burden of the overall population.

CHAPTER III
METHODOLOGY

3.1 Study design

The study was cross-sectional which allowed for the estimation of frequency of use and identification of factors associated with HIV self-testing.

3.2 Scope of the study

The study was conducted at the UoN Chiromo and KNH campuses, which are 2- and 3-kilometers North & Southwest of Nairobi, the capital city of Kenya.

3.3 Study Population

The study involved undergraduate medical students from the University of Nairobi,Faculty of Health Sciences undertaking bachelor's degree in MBChB, Pharmacy, Nursing, Dentistry and Medical Laboratory Sciences. The different courses formed clusters which were further stratified by year of study to ensure representation across all the levels and increase precision of the estimates.

University of Nairobi was purposely selected because it is a public university that draws students from all over the country hence a representation of university students. The university boasts of approximately 84000 overall student population. There are currently eleven faculties at the UoN offering different programs at both undergraduate and postgraduate (masters and doctoral) levels. These include faculties of: Veterinary Medicine, Social Sciences, Science and Technology, Law, Agriculture, Business and Management Science, Education, Arts, Engineering, Built Environment and Design and Health Sciences.

The faculty of Health Sciences has an approximate undergraduate student population of about 4000 students distributed in the various departments of: Medicine, Dental Sciences, Nursing Sciences, Public and Global Health, Pharmacy, and Medical Laboratory Science and Technology.

3.4 Sample Size

Since the total population was known, we applied the Slovin's formula (Oakland, 1953) to estimate sample size to be used in the study. An average number of 4732 students the UoN-FHS as per Kalimbo (2021) was used.

$$n = \frac{N}{1 + N(e)^2} \qquad 3.1$$

Where,

n = desired sample size

N= total population; student population of CHS-UoN is 4732

e = level of precision is 0.05

n = 4732/(1+(4732*0.052)

n = 368.8

n_0 = 369

3.4.1 Adjusting for sample size in finite population

If the population is small (< 10000) then the sample size is adjusted by correcting for finite population for proportion:

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}} \qquad 3.2$$

n_0 = 369

n = 369/(1 + ((369−1) ÷ (4732)))

n = 342.3

n = 343

3.4.2 Adjusting for clustering using design effect

To account for the variance inflation due to homogeneity within clusters, a design effect of 1.2 will be assumed in present study (Alimohamadi and Sepandi 2019; Rutterford et al., 2015). Hence the study's sample size will be: 343* 1.2 = 411.6 (412)

3.4.3 Sample size distribution across clusters

Cognizant of the unbalanced nature of number of students in the different courses, sample size proportional to the population size was used to determine the number of students to sample from each course. Thereafter, the individual-course sample size was distributed equally throughout the years of study (depending on the years-of-study for each particular course). The study also borrowed population sizes for the individual courses from Kalimbo (2021) as shown in table 3.1 below.

Table 3.1: Sample Size Distribution Table

Course	Number of students	Proportion	Sample size allocation	Sample size per class (year of study)
MBChB	2747	2747/4378	0.62*412= 259	238/5=40
BSc. Nursing	420	420/4378	0.09*412= 40	37/4=10
Dentistry	278	278/4378	0.06*412= 26	25/5=5
Pharmacy	653	653/4378	0.15*412= 61	58/5=12
Medical laboratory	280	280/4378	0.06*412=26	25/4=7
Sum	**4378**	**1**	**412**	

3.5 Sampling Procedure

Multi-stage cluster sampling method was used. The design involved two-stage cluster sampling. The primary sampling units (PSU's) were all medical courses found in the UoN, FHS. The secondary stage units (SSU's) were the various year of study for the courses. Simple random sampling (SRS) was used to randomly select SSU's and students in the respective level of study. Sampling frame was composed of registration numbers of all students

(was obtained from class representatives) and a random number generator was used to pick the specific students to be enrolled in the study.

Sampling without replacements was applied to generate two lists (A and B) where list B was used whenever a respondent in list A was not located or did not fit the inclusion criteria. The final list of study participants was shared with trained enumerators from the respective courses to locate, seek consent and administer the questionnaires.

3.6 Eligibility of Study Participants

3.6.1 Inclusion Criteria

i. Undergraduate student of University of Nairobi faculty of Health Sciences studying at Chiromo and KNH campus.

ii. Students aged between 18-24 years (Youth, 2014)

3.6.2 Exclusion Criteria

i. Students already aware that they are HIV positive. This population was assumed not to undergo routine testing.

ii. Students doing end-of-semester/year exams as it would go against the ethical requirement for not interfering with the participants' academic schedules/program by participating in the study.

3.7 Pretest study

The pilot study was conducted on undergraduate students of University of Nairobi Parklands campus, which hosts the Faculty of Law. The sample size was a pre-determined number of 25 students (Hertzog, 2008)

3.8 Validity and Reliability of Study

Validity is defined as meaningfulness and accuracy of inferences based on the study findings. It defines the strength of study inferences, propositions, conclusions, or the extent to which

results gotten from the analysis of data does represent the phenomenon of understanding (Oso & Onen, 2005). To enhance the validity of the statistics, enumerators were trained on the data collection tools and the pilot study used to test the tools. Any issues arising from the pilot study was used to revise the questionnaire accordingly before deployment.

Reliability measures the extent to which an instrument of research produces consistent results or produces data the same way for every time it is applied under similar conditions with similar subjects (Mugenda & Mugenda, 1999). This was realized through accurate sample size calculation and was further enhanced through use of the appropriate statistical approaches.

3.9 Data Collection

Data collection was done using self-administered questionnaires. Questionnaires were designed through survey monkey; an online open-source data collection platform was used. After determining sample sizes, list of students' registration numbers and their classes was sought through the respective class representatives. The list acted as the sampling frame upon which simple random selection was performed to obtain sampling elements/respondents. The list containing respondents' registration numbers was then shared with the class representatives to obtain their email addresses.

Verbal consent was sought by the respective class representatives' and replacement done where consent was not given to minimize on the non-response rate. An introductory statement was included at the beginning of the questionnaire to describe the purpose and benefit of the study to help in increasing completeness. Written consent was also included immediately before the start of the questionnaire.

3.10 Ethical consideration

Several levels of data safety and security measures were employed to ensure ethical considerations have been met. The study obtained ethical clearance (P346/04/2023) from the Kenyatta National Hospital- University of Nairobi, Ethical Review Committee (KNH-UoN ERC). To ensure confidentiality, the filled questionnaires were automatically sent to the principal investigators' account that was not accessible to enumerators. This evaded the risks of enumerators accessing information of their college mates. Moreover, random number generators were used as unique identifiers rather than student's name or their registration numbers. Finally, the data will be discarded after successful defense of the thesis.

The study was done at the University of Nairobi, Faculty of Health Sciences based in Chiromo and Kenyatta Hospital campuses. Verbal consent was sought from the health sciences students participating in the study and replacement done where consent was not given. The objectives of the study were clearly explained to the health sciences students and any arising questions sufficiently addressed before seeking their consent. Only consenting health sciences students were recruited. The process ensured the consenting health sciences students are adequately informed, that their participation is voluntary, and that they can withdraw at any point during the study. The consenting health sciences students' identities were anonymized by using random unique identifiers rather than their names or personal identities to ensure confidentiality.

3.11 Study Significance

The research provided useful information about predictors of HIV self-testing utilization, including determinants to its use. It also demonstrated the levels of self-awareness of HIV serological status amongst the youthful population. Beneficiaries of the study include the Ministry of Health-Kenya, Ministry of Education-Kenya, National AIDS & STI Control Program (NASCOP), University of Nairobi, scholars, various stakeholders, and other similar universities who will utilize the findings to advise on policy change and formulation of new strategies in the prevention of HIV transmission and infection among youths and university

students.

3.12 Data Analysis

Data analysis was performed using R software version 4.2.2 (2022-10-31 UCRT)

3.12.1 Descriptive Statistics and Variable selections

A dichotomous table stratified into positive and negative users was developed for all the study variables and chi-square test for independence was applied in each variable to test for association with HIV-self testing. Fisher's exact test was applied as an alternative to chi- square test, where observations of less than 6 were recorded. Variables with p-value < 0.05 were passed for model development.

3.12.2 Model development

Multilevel logistic regression accounting for the random effects in the hierarchical nature of our cluster variable was used. The hierarchy in this case was brought about by the different years of study nested within courses and courses nested within the faculty of health sciences (FHS). The other variables were fitted as fixed effects with use of self-testing kit as the outcome/dependent variable. Based on the dichotomous nature of the dependent variable (yes/no), a binary logistic mixed model was fitted with the following general form:

$$ln(\frac{p}{1-p}) = x\beta + z\mu + \varepsilon \qquad 3.3$$

Where y represented the outcome variable (whether/not a student used HIV self-testing kit), X was the matrix of predictor variables (fixed effects) and their corresponding fixed effects coefficients β. Z represented the matrix for random effects while μ was the random effects vector.Symbol ε denoted model residuals as a representation of part of the outcome variable that was not explained by the model.

The model therefore had an advantage of providing fixed estimate for the courses (including overall average proportion of students using HIV-self testing kits) and random estimates for every course (as course-specific proportions). The latter was vital for the study because the use of HIV self-testing kit within a course may be correlated such that responses from one course (within variation) are homogeneous compared to responses between two courses(between

variation).

The random effects vector μ were assumed to follow a normal distribution with mean 0 and variance G:

$$\mu \sim N(0, G) \quad 3.4$$

Where G is a square and symmetric variance-covariance matrix of the random effects. For simplicity, G was represented by an estimate θ without the redundant effects to assist in realizing a positive definite estimate matrix.

$$G = \sigma(\theta) \quad 3.5$$

Therefore, the mixed model equations of the two levels (student and course) was represented using the *i*-th students for the *j*-th course. Level one models contained values of the β parameters to specify the course. Level two models on the other hand represented the β estimates for each course β_{pj} using the mean estimate for the parameter being assessed Y_{po}, and a random effect for that course μ_{pj}.

Level 1: $$Y_{ij} = \beta_{0j} + \beta_{1j}Var1_{ij} + \beta_{2j}Var2_{ij} + ...\beta_{n-1j}Var(n-1)_{ij} + \varepsilon_{ij} \quad 3.6$$

Level 2: $$\beta_{0j} = Y_{00} + \mu_{0j}$$ for all the variables 3.7

Combined fixed and random effects model were as shown below:

$$Y_{ij} = (Y_{00} + \mu_{0j}) + Y_{1j}Var1_{ij} + Y_{2j}Var2_{ij} + ... + \varepsilon_{ij} \quad 3.8$$

3.12.3 Statistical computing

Step1. Estimating the overall proportion of HIVST utility among UoN-FHS undergraduate students using fixed effects binary logistic null model

An independent binary logistic null model was developed, fitted with the intercept only to represent fixed effects null model. The fixed effects model estimate represented the proportion of students using HIV-self testing kit, while its standard deviation showed the possible extent of variation in the estimate, indicating potential clustering.Accompanying p-value were used to determine whether on average, a significant proportion of students utilize HIVST kits.

Step 2. Estimating the course/year proportion of HIVST utility among UoN-FHS undergraduate students using random effects binary logistic null model

The random effects binary logistic null model on the other hand provided cluster-specific estimates (proportions) and further assessed whether they varied significantly from each other. The model took different forms to identify the significance of the grouping variables when fitted as an intercept only model with random effects.

a. Binary logistic random effects null model fitted with course variable as the random effects,

$$HIVST \sim (1|Course, data) \quad 3.9$$

b. Binary logistic random effects null model fitted with year of study variable as the random effects,

$$HIVST \sim (1|Year of Study, data) \quad 3.10$$

c. Binary logistic random effects null model fitted with intercepts varying between the courses and year-of-study within the courses.

$$HIVST \sim (1|Course) + (1|Year of Study, data) \quad 3.11$$

d. Binary logistic random effects null model fitted with year of study as a random slope and course as random intercept.

$$HIVST \sim (Course|Year of Study) \quad 3.12$$

Factors affecting utility of HIVST.

Using the best applicable model, simple models were used to run all the variables collected in the study to obtain crude odds ratio and thereafter, all the variables fitted to a single saturated model including test for interaction terms.

Simple binary logistic mixed effects model

$$HIVST \sim \beta_0 + \beta_i X_i + (\text{random effects}) \quad 3.13$$

Where i = independent variables age, sex etc.

Multiple/adjusted binary logistic mixed effects model.

$$HIVST \sim \beta_0 + \beta_i X_i + ... + \beta_{n-1} X_{n-1} + (random\ effects) \quad 3.14$$

Model validation

Both the AIC and Bayesian information criterion (BIC) values were used to assess for performance of the four models. Model with the lowest AIC and BIC values was picked and fitted in an adjusted multivariable fixed model to assess predictors for HIVST. The amount of Intraclass correlation coefficient (ICC) was determined for the selected model using intercept and residual terms as shown below:

$$ICC = \frac{intercept^2}{(intercept^2 + residual^2)} \quad 3.15$$

Model assumptions such as multicollinearity and influential values were assessed before validating the model. Adjustments were made to the model based on the results from model assumptions to come up with a final selected model. Variance inflation factor (VIF) was used to check for multicollinearity (cut off value – 5) with the selection of variables to include upon violation based on model AIC value after independently fitting the two variables.

The study used 0.05 as the level of significance. Both the p-value (less than 0.05) and 95% confidence intervals (not including the null value) were used to justify significant results.

CHAPTER IV
RESULTS

4.1 Socio-demographic characteristics

A total of 412 students participated in the study. Two failed to consent and were replaced to achieve the sample size. Department of medicine had the highest number of respondents (n=238, 57.8%), with the department of Medical Laboratory contributing the lowest to the sample size (n=27, 6.6 %). Figure 4.1 below highlights distribution of sample size across all the faculties involved in the study.

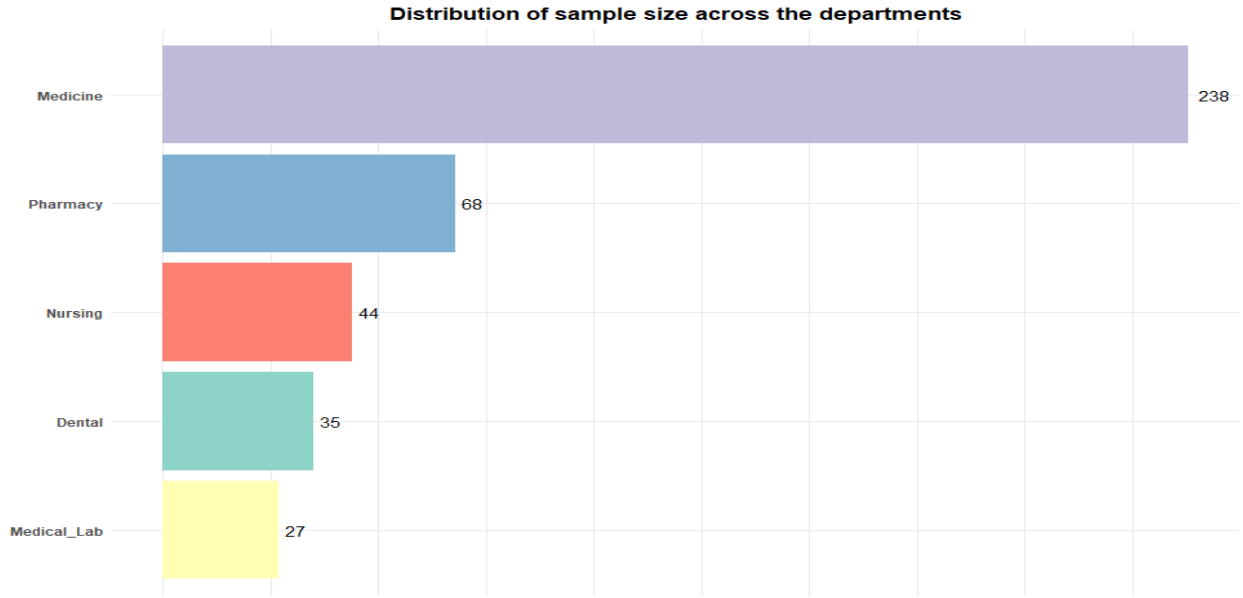

Figure 4.1 Distribution of Sample Size to the Courses of Medicine, Pharmacy, Nursing, Dentistry & Medical Laboratory

The ages ranged from 18 to 25 years with 22 years old accounting for 17.2% (n=71) and 23 years old, making up 16.5% (n=68). Overall, 50.5% (n=208) of the respondents were male. The percentage of female respondents was higher than that of male in all faculties other than department of medicine (n = 105; 43.9%) and department of pharmacy (n = 34; 50%). The bar graph below (Fig 4.2) highlights the distribution of gender across the different faculties.

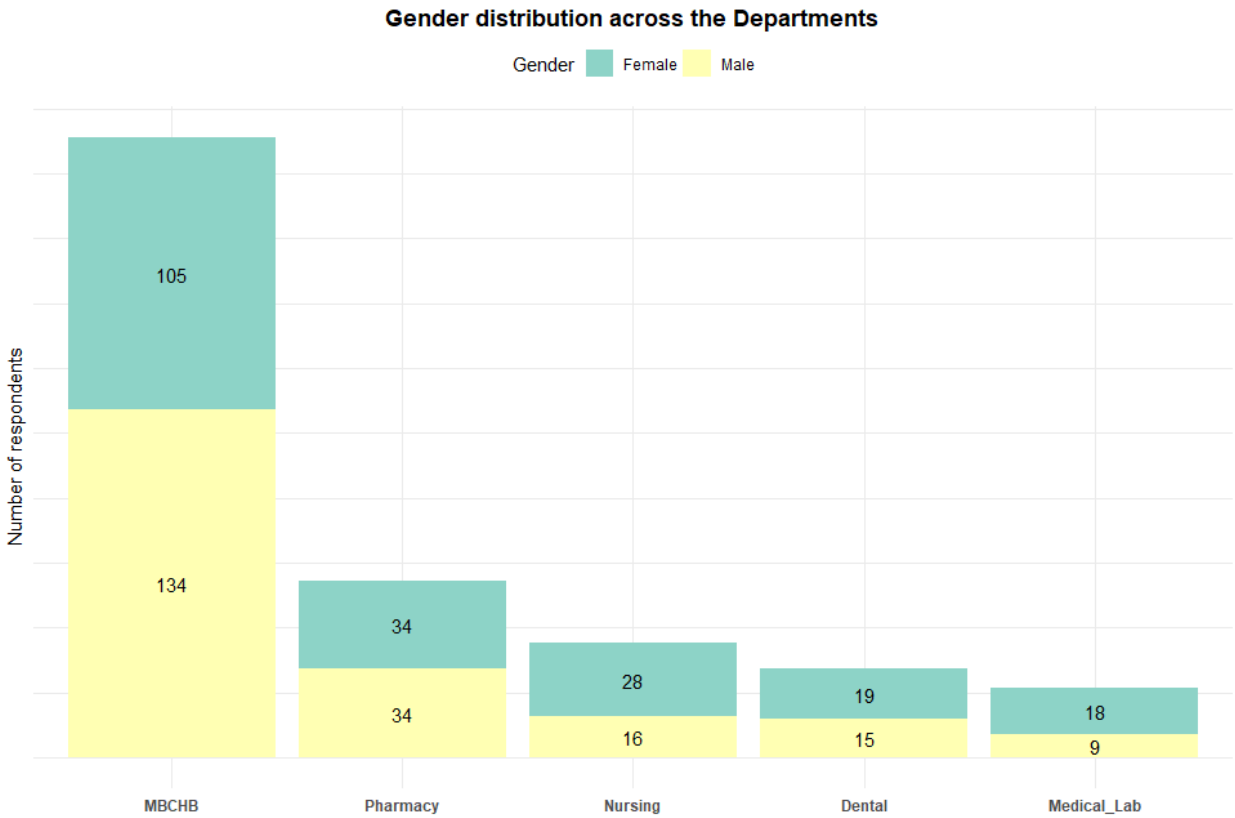

Figure 4.2 Distribution of Gender to Courses of Medicine, Pharmacy, Nursing, Dentistry & Medical Laboratory

The total number of respondents that were single was 399 (96.8%), 1.7% (n=7) were in a relationship, and 1.5% (n=6) were married. In the Dental course, all participants (100%, n=35) were single. In the MBCHB course, 95.8% (n=228) were single, 2.1% (n=5) were in a relationship, and 2.1% (n=5) were married. In the Medical Laboratory course, 96.3% (n=26) were single, 3.7% (n=1) were in a relationship, and none were married. In the Nursing course, all participants (100%, n=44) were single. In the Pharmacy course, 97.1% (n=66) were single, 1.5% (n=1) were in a relationship, and 1.5% (n=1) were married.

Overall, 90.5% (n=373) were Christian, 6.3% (n=26) were Muslim, 1.9% (n=8) were Atheist, 0.7% (n=3) were Hindu, and 0.5% (n=2) were Sikh. Similar pattern was observed within the faculties. Additionally, majority of students reported to be studying full-time in all the faculties. Table 4.1 below highlights the frequency of variables assessed during the study and the different levels.

Table 4.1 Distribution of sample size with sociodemographic characteristics

Characteristic	Total = 412	Dental, N = 35	MBCHB, N = 239	Medical lab, N = 27	Nursing, N = 44	Pharmacy, N = 68
Age (Years)						
18	26(6.3%)	1 (2.9%)	19 (8%)	2 (7.4%)	2 (4.5%)	2 (2.9%)
19	59(14.3%)	4 (11.4%)	36 (15.1%)	3 (11.1%)	10 (22.7%)	6 (8.8%)
20	63(15.3%)	6 (17.1%)	35 (14.7%)	4 (14.8%)	11 (25%)	7 (10.3%)
21	51(12.4%)	6 (17.1%)	23 (9.7%)	9 (33.3%)	7 (15.9%)	6 (8.8%)
22	71(17.2%)	12 (34.2%)	31 (13%)	5 (18.5%)	9 (20.5%)	14 (20.6%)
23	68(16.5%)	3 (8.6%)	47 (19.7%)	1 (3.7%)	2 (4.5%)	15 (22.1%)
24	44(10.7%)	1 (2.9%)	22 (9.2%)	3 (11.1%)	1 (2.3%)	17 (25%)
25	30(7.3%)	1 (2.9%)	26 (10.9%)	0 (0%)	2 (4.5%)	1 (1.5%)
Gender						
Male	208(50.5%)	15 (44.1%)	134 (56.1%)	9 (33.3%)	16 (36.4%)	34 (50%)
Female	204(49.5%)	19 (55.9%)	105 (43.9%)	18 (66.7%)	28 (63.7%)	34 (50%)
Marital status						
Single	399(96.8%)	35 (100%)	228 (95.8%)	26 (96.3%)	44 (100%)	66 (97.1%)
Relationship	7(1.7%)	0 (0%)	5 (2.1%)	1 (3.7%)	0 (0%)	1 (1.5%)
Married	6(1.5%)	0 (0%)	5 (2.1%)	0 (0%)	0 (0%)	1 (1.5%)
Religion						
Atheist	8(1.9%)	1 (2.9%)	6 (2.5%)	0 (0%)	0 (0%)	1 (1.5%)
Christian	373(90.5%)	32 (91.4%)	208 (87.4%)	27 (100%)	42 (95.5%)	64 (94.1%)
Sikh	2(0.5%)	0 (0%)	2 (0.8%)	0 (0%)	0 (0%)	0 (0%)

Table 4.1 Continued: Distribution of sample size with sociodemographic characteristics

Characteristic	Total = 412	Dental, N = 35	MBCHB, N = 239	Medical lab, N = 27	Nursing, N = 44	Pharmacy, N = 68
Muslim	26(6.3%)	2 (5.7%)	19 (8.0%)	0 (0%)	2 (4.5%)	3 (4.4%)
Hindu	3(0.7%)	0 (0%)	3 (1.3%)	0 (0%)	0 (0%)	0 (0%)
Mode of study						
Full time	409(99.3%)	35 (100%)	235 (98.7%)	27 (100%)	44 (100%)	68 (100%)
Part time	3(0.7%)	0 (0%)	3 (1.3%)	0 (0%)	0 (0%)	0 (0%)
Source of funds						
Mixed sources	1(0.2%)	0(0%)	1(0.4%)	0(0%)	0(0%)	0(0%)
Formal employment	1(0.2%)	0(0%)	1(0.4%)	0(0%)	0(0%)	0(0%)
Government – HELB	39(9.5%)	1(2.9%)	23(9.7%)	2(7.4%)	4(9.1%)	9(12.9%)
HELB + Self employment	1(0.2%)	0(0%)	1(0.4%)	0(0%)	0(0%)	0(0%)
Parents/Guardians	352(85.6%)	32(94.1%)	201(85.2%)	22(81.5%)	39(88.6%)	58(82.9%)
Self-employment	12(2.9%)	1(2.9%)	8(3.4%)	2(7.4%)	0(0%)	1(1.4%)
Temporary jobs	5(1.2%)	0(0%)	1(0.4%)	1(3.7%)	1(2.3%)	2(2.9%)

Table 4.2 : Distribution of sample size with HIVST characteristics

Characteristic	Total = 412	Dental, N = 35	MBCHB, N = 239	Medical lab, N = 27	Nursing, N = 44	Pharmacy, N = 68
Type of HIVST Preferred						
None	3(3.7%)	0(0%)	3(6.4%)	0(0%)	0(0%)	0(0%)
Blood	53(64.6%)	4(80%)	28(59.6%)	3(100%)	6(42.9%)	12(85.7%)
Oral	27(32.9%)	1(20%)	16(34.0%)	0(0%)	8(57.1%)	2(14.3%)
Ease Understanding HIVST Use Instructions						
Easy	1(1.2%)	0(0%)	0(0%)	0(0%)	1(7.1%)	0(0%)
Not easy	81(98.8%)	5(100%)	46(100%)	3(100%)	13(92.9%)	14(100%)
Tested with Partner?						
Yes	48(60.8%)	1(20%)	28(63.6%)	3(100%)	9(64.3%)	7(53.8%)
No	31(39.2%)	4(80%)	16(36.4%)	0(0%)	5(35.7%)	6(46.2%)
Counselled after Test						
Yes	77(93.9%)	4(80%)	43(93.5%)	3(100%)	14(100%)	13(92.9%)
No	5(6.1%)	1(20%)	3(6.5%)	0(0%)	0(0%)	1(7.1%)
PREP Awareness						
Aware	61(14.9%)	9(26.5%)	34(14.4%)	0(0%)	10(22.7%)	8(11.6%)
Unaware	349(85.1%)	25(73.5%)	202(85.6%)	27(100%)	34(77.3%)	61(88.4%)

Table 4.2 Continued: Distribution of sample size with HIVST characteristics

Characteristic	Total = 412	Dental, N = 35	MBCHB, N = 239	Medical lab, N = 27	Nursing, N = 44	Pharmacy, N = 68
Confident of HIVST Results						
Not confident	4(4.9%)	0(0%)	1(2.2%)	1(33.3%)	1(7.1%)	1(7.1%)
Confident	78(95.1%)	5(100%)	45(97.8%)	2(66.7%)	13(92.9%)	13(92.9%)

Table 4.3:Distribution of sample size with Sexual behavior characteristics

Characteristic	Total = 412	Dental, N = 35	MBCHB, N = 239	Medical lab, N = 27	Nursing, N = 44	Pharmacy, N = 68
Ever had sex						
Yes	178(43.8%)	11(33.3%)	108(46.6%)	13(48.1%)	21(47.7%)	25(35.7%)
No	228(56.2%)	22(66.7%)	124(53.4%)	14(51.9%)	23(52.3%)	45(64.3%)
Sexual activeness						
Not sexually active	237(58.2%)	18(54.5%)	141(60.5%)	18(66.7%)	28(63.6%)	32(45.7%)
Sexually active	170(26.3%)	15(45.5%)	92(39.5%)	9(33.3%)	16(36.4%)	38(54.3%)
Used Protection						
No	110(44.0%)	10(41.7%)	74(53.2%)	1(7.1%)	9(37.5%)	16(32.7%)
Yes	140(56.0%)	14(58.3%)	65(46.8%)	13(92.9%)	15(62.5%)	33(67.3%)
Have Multiple Sex Partners						
No	228(84.8%)	21(87.5%)	137(87.3%)	14(100%)	18(75%)	38(76%)
Yes	41(15.2%)	3(12.5%)	20(12.7%)	0(0%)	6(25%)	12(24%)
Aware of '*Chukua Selfie*'						
Aware	206(50%)	19(55.9%)	119(50.2%)	14(51.9%)	24(54.5%)	30(42.9%)
Not Aware	206(50%)	15(44.1%)	118(49.8%)	13(48.1%)	20(45.5%)	40(57.1%)

Table 4.4: Distribution of sample size showing knowledge of HIV

Characteristic	Total = 412	Dental, N = 35	MBCHB, N = 239	Medical lab, N = 27	Nursing, N = 44	Pharmacy, N = 68
Would Share HIV Results with Partner						
No	28(36.0%)	0(0%)	15(36.6%)	2(100%)	5(35.7%)	5(38.5%)
Yes	48(64.0%)	5(100%)	26(63.4%)	0(0%)	9(64.3%)	8(61.5%)
HIV: A Serious Disease?						
No	6(1.5%)	0(0%)	4(1.7%)	0(0%)	1(2.3%)	1(1.4%)
Yes	402(98.3%)	33(97.1%)	231(98.3%)	27(100%)	43(97.7%)	68(98.6%)
Not sure	1(0.2%)	1(2.9%)	0(0%)	0(0%)	0(0%)	0(0%)
HIV infection from Saliva of HIV infected person						
No	213(52.5%)	14(41.2%)	133(57.1%)	11(40.7%)	18(40.9%)	37(54.4%)
Yes	193(47.5%)	20(58.8%)	100(42.9%)	16(59.3%)	26(59.1%)	31(45.6%)

Table 4.5: Distribution of sample size showing Stigma towards HIV

Characteristic	Total = 412	Dental, N = 35	MBCHB, N = 239	Medical lab, N = 27	Nursing, N = 44	Pharmacy, N = 68
Ashamed if family Member has HIV?						
Strongly Disagree	160(51.2%)	14(53.8%)	94(54.3%)	6(30%)	16(48.5%)	30(49.2%)
Disagree	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Neutral	103(32.9%)	10(38.4%)	45(26.0%)	13(60%)	34(39.4%)	23(37.7%)
Agree	38(12.1%)	2(7.7%)	23(13.3%)	2(10%)	4(12.1%)	7(1.5%)
Strongly Agree	12(3.8%)	0(0%)	11(6.4%)	0(0%)	0(0%)	1(1.6%)
Fear of Partner's Reaction to Positive HIV Result						
No	22(5.3%)	3(8.8%)	12(5.1%)	1(3.7%)	2(4.5%)	4(5.7%)
Yes	390(94.7%)	31(91.2%)	225(94.9%)	26(96.3%)	42(95.5%)	66(94.3%)
Stigma: Discussing those with HIV negatively?						
No	94(22.9%)	9(26.5%)	59(25.1%)	3(11.1%)	13(29.5%)	10(14.3%)
Yes	316(77.1%)	25(73.5%)	176(74.9%)	24(88.9%)	31(70.5%)	60(85.7%)
Buy Meat from HIV+ Butcher?						
No	134(32.8%)	13(38.2%)	77(32.9%)	8(29.6%)	12(27.3%)	24(34.3%)
Yes	275(67.2%)	21(61.8%)	157(67.1%)	19(70.4%)	32(72.7%)	46(65.7%)

Table 4.5 continued: Distribution of sample size showing Stigma towards HIV

Characteristic	Total = 412	Dental, N = 35	MBCHB, N = 239	Medical lab, N = 27	Nursing, N = 44	Pharmacy, N = 68
HIV Discordant Relationships Work						
No	130(31.9%)	11(32.4%)	74(31.8%)	8(30.8%)	14(31.8%)	23(32.9%)
Yes	277(68.1%)	23(67.6%)	159(68.2%)	18(69.2%)	30(68.2%)	47(67.1%)
HIV+ Couple can get HIV- Child						
No	28(6.8%)	5(14.7%)	10(4.2%)	1(3.7%)	5(11.4%)	7(10%)
Yes	384(93.2%)	29(85.3%)	227(95.8%)	26(96.3%)	39(88.6%)	63(90%)

Table 4.6: Distribution of sample size who were counselled Pre and post-test and charged for HIVST

Characteristic	Total = 412	Dental, N = 35	MBCHB, N = 239	Medical lab, N = 27	Nursing, N = 44	Pharmacy, N = 68
Pre-counselling before HIVST						
No	36(50.7%)	2(66.7%)	20(47.6%)	1(33.3%)	8(61.5%)	5(50%)
Yes	35(49.3%)	1(33.3%)	22(52.4%)	2(66.7%)	5(38.5%)	5(50%)
Linked to counsellor after HIVST						
No	53(84.1%)	2(50%)	39(92.9%)	3(75%)	2(100%)	7(63.6%)
Yes	10(15.9%)	2(50%)	3(7.1%)	1(25%)	0(0%)	4(36.4%)
Charged for HIVST						
No	43(59.7%)	2(66.7%)	27(62.8%)	1(33.3%)	9(69.2%)	4(40%)
Yes	29(40.3%)	1(33.3%)	16(37.2%)	2(66.7%)	4(30.8%)	6(60%)

4.2 Frequency of use of HIVST

Among those who agreed to respond to the question on whether they use HIVST kits (n=271), the use of HIV self-testing kit was 30.5% (n = 83) with a 95% confidence interval of 25.2% - 36.4%.

Figure 4.3 below highlights the frequency of use of HIVST across the different faculties.

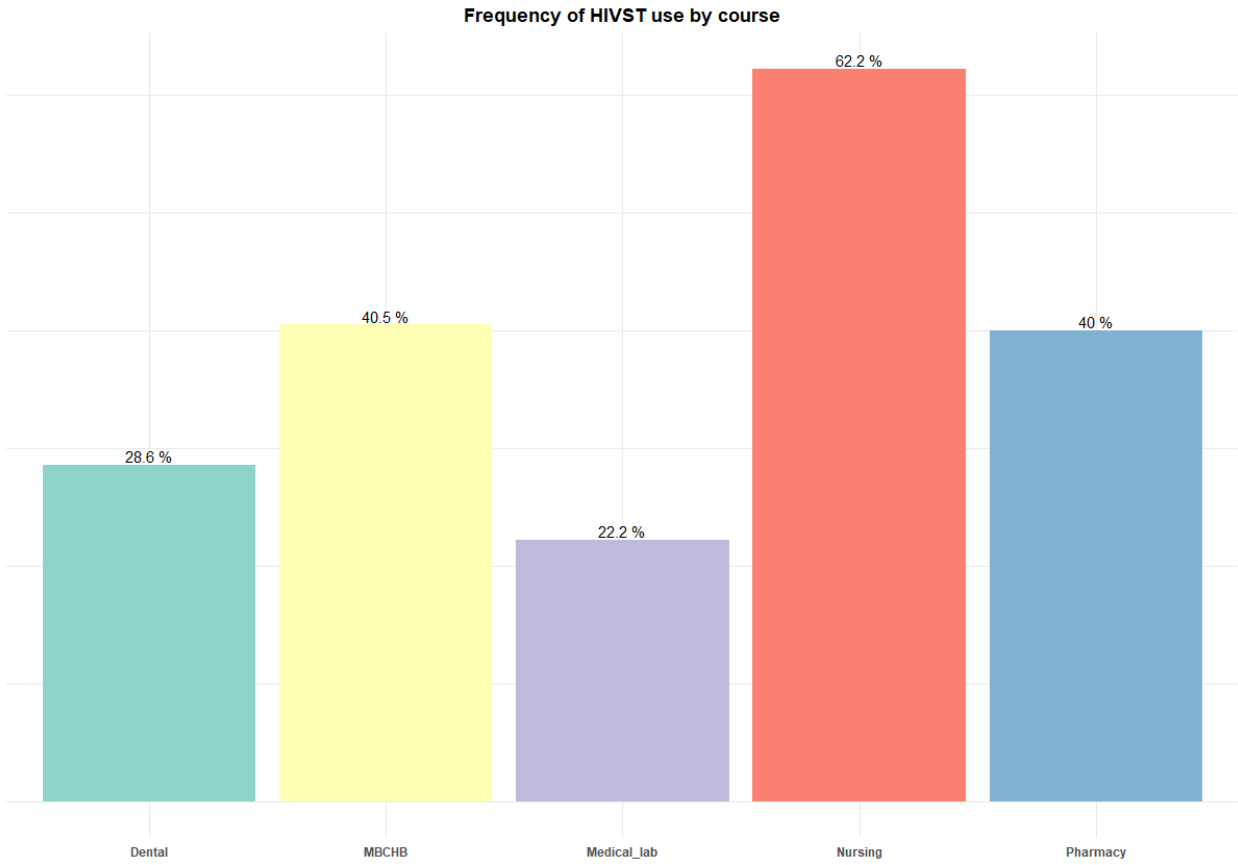

Figure 4.3: Frequency of use of HIVST across UoN Courses of Health Sciences

4.3 Strength and significance of variations in HIVST across course-type and year-of-study

4.3.1 Demographic characteristics

The median age of those students who responded to use HIV self-testing kits was 23.0 years old; IQR: 21.5–24.0 years old was different from the median age of students who do not use HIV self-testing kit - 22 years old; IQR: 20-23 years old (p value – 0.03) (table 4.7). Fisher's exact test results applied in the marital status categories showed significant association between the different categories of marital status and outcome of HIVST use (p-value 0.04).

There was also significant association between the different years of study and the utility for HIVST (p-value 0.003). A deeper insight into the individual years of study showed significantly higher proportions of students not using HIVST in year 1 (HIVST use negative 12.2% vs HIVST use positive 1.2%; p-value 0.007), year 3 students (HIVST use negative 21.8% vs HIVST use positive 11.0%; p-value 0.05). A reverse trend was seen amongst those in year 6 where significantly higher percentage were using HIVST compared to those who do not (HIVST use negative 3.2% vs HIVST use positive 11.0%; p-value 0.023).

There was significant association between last time HIV test was done and the outcome of HIVST utility (p-value < 0.0001). Within those who tested for HIV in the last three months, there was a significantly higher percentage of students responding to have used HIVST (HIVST use negative 39.0% vs HIVST use positive 13.8%; p-value < 0.0001).

This was also the case for those who reported to have tested for HIV in the last six months (HIVST use negative 32.9% vs HIVST use positive 19.1%; p-value 0.0211). A dissimilar trend was however, seen in those who reported to have tested more than one year ago with a significantly higher percentage in the HIVST negative group (HIVST use negative 28.0% vs HIVST use positive 66.5%; p-value < 0.0001). Table 4.7 below highlights and summarizes the performance of variables in the variable selection step using chi-squared, fisher's exact and Mann-U Whitney test. It also highlights frequencies for the different levels of demographic variables between HIVST positive and negative responses and descriptive analysis to show relationship.

Table 4.7: Relationship between Demographic Characteristics & Use of HIVST Kits

Characteristic	HIVST-ve, n = 188	HIVST+ve, n= 82	Statistical significance
			Wilcoxon sum-rank test
Age	22.0 (IQR: 20.0-23.0)	23.0(IQR:21.5-24.0)	**p=0.03**
Gender			
Male	96 (51%)	40 (49%)	X^2 (1) < 0.001
Female	92 (49%)	42 (51%)	p > 0.9
Marital Status			
Single	182 (97%)	77 (94%)	X^2 (1) = 0.002
Relationship	5 (2.7%)	1 (1.2%)	p = 0.968
Married	1 (0.5%)	4 (4.9%)	
Religion			
Atheist	2 (1.1%)	4 (4.9%)	
Christian	178 (95%)	74 (90%)	*Fisher's exact test*
Sikh	0 (0%)	1 (1.2%)	p = 0.1355
Muslim	7 (3.7%)	3 (3.7%)	
Hindu	1 (0.5%)	0 (0%)	
Mode of study			
Full time	186 (99%)	82 (100%)	*Fisher's exact test*
Part time	2 (1.1%)	0 (0%)	p > 0.9
Department			
Dentistry	17 (9.0%)	5 (6.1%)	
Medicine	130 (69%)	51 (62%)	X^2 (1) = 3.427
Nursing	19 (10%)	13 (16%)	p = 0.33
Pharmacy	22 (12%)	13 (16%)	
Course			
Dental	17 (9.0%)	5 (6.1%)	
MBCHB	115 (61%)	48 (59%)	X^2 (1) = 4.763
Medical Laboratory	15 (8.0%)	3 (3.7%)	p = 0.313
Nursing	19 (10%)	13 (16%)	
Pharmacy	22 (12%)	13 (16%)	
Year of Study			
1	23 (12%)	1 (1.2%)	
2	39 (21%)	15 (18%)	*Fisher's exact test*
3	41 (22%)	9 (11%)	**p = 0.0013**
4	40 (21%)	25 (30%)	
5	39 (21%)	23 (28%)	
6	6 (3.2%)	9 (11%)	
Residency			
In school	121 (64%)	50 (61%)	X^2 (1) = 0.294
Out of school	67 (36%)	32 (39%)	p = 0.69

Key: HIVST +/-ve: HIVST use/not used, IQR: Interquartile range, X^2 (): Chi-Square value with corresponding degree of freedom

4.3.2 Individual Characteristics

Other than variables assessing whether respondent had knowledge about HIVST campaign dubbed '*Chukua Selfie*' and source of funds, all the other variables assessing for level of awareness in HIVST had no responses in the HIVST negative category. The '*Chukua Selfie*' awareness campaign and source of funds responses did not show any relationship with the outcome of HIVST

use. All students who responded to the type of HIV test they preferred picked both VCT and self-testing with majority of them having (n=51, 96.2%) used HIV self-testing before. The variable, type of HIV test, showed strong relationship with use of HIVST kits ($p < 0.001$). In the variable assessing if the respondent had been linked to a counsellor and whether the response was related to use of HIV self-testing, Fisher's exact test was applied since there were categories with less than a count of five. The results were, however, not statistically significant at 0.05 level of significance ($p = 0.057$) as summarized in table 4.8 below.

Table 4.8 Relationship between Individual Characteristics Variables and Use of HIVST Kits

Characteristic	HIVST-ve, n = 188	HIVST+ve, n = 83	Statistical significance
Aware of '*Chukua Selfie*'			
Not aware	89 (47%)	34 (41%)	X^2 (1) = 0.6439
Aware	100 (53%)	49 (59%)	p = 0.423
Type of HIV test			X^2 (1) = 45.302
VCT &HIVST	2(3.8%)	51(96.2%)	**p < 0.001**
Source of Funds			
Mixed sources	1 (0.5%)	0 (0%)	
Government-HELB	20 (11%)	7 (8.5%)	
HELB & Self employment	1 (0.5%)	0 (0%)	*Fisher's Exact test*
Parents/Guardians/Caregivers			
Stipend	159 (84%)	71 (87%)	0.961
Self-employment	6 (3.2%)	3 (3.7%)	
Temporary jobs	2 (1.1%)	1 (1.2%)	
Fear of Partner's Reaction to Positive HIV Result			
No	7 (3.7%)	4 (4.8%)	*Fisher's exact test*
Yes	182 (96%)	79 (95%)	0.7
Stigma: Discussing those with HIV Negatively			
No	46 (24%)	18 (22%)	X^2 (1) = 0.085
Yes	142 (76%)	64 (78%)	p = 0.771
Buy Meat from HIV+ Butcher			
No	56 (30%)	26 (31%)	X^2 (1) = 0.0079
Yes	131 (70%)	57 (69%)	p = 0.931
HIV: A Serious Disease?			
No	2 (1.1%)	2 (2.4%)	*Fisher's exact test*
Yes	187 (99%)	80 (98%)	p=0.6

Table 4.8 Continued

Characteristic	HIVST-ve, n = 188	HIVST+ve, n = 83	Statistical significance
Ashamed if Family Member has HIV			
Strongly disagree	82 (56%)	33 (52%)	
Neutral	46 (32%)	21 (33%)	*Fisher's exact test*
Agree	14 (9.6%)	7 (11%)	p=0.8
Strongly agree	4 (2.7%)	3 (4.7%)	
Linked to Counsellor after HIVST			
No	26 (90%)	6 (60%)	Fisher's Exact test
Yes	3 (10%)	4 (40%)	p = 0.057

Key: HIVST +/-ve: HIVST use/not used, X^2 (df): Chi-Square value with corresponding degree of freedom

4.3.2.1 Risky Sexual Practices

There was a statistically significant relationship between use of HIV self-testing kits and risky sexual practices like whether respondent has ever had sex (X^2 (1) = 4.5245; p-value - 0.033), whether respondent is sexually active (X^2 (1) = 4.353; p-value 0.037) and whether respondent had protected sex (X^2 (1) = 4.353; p-value 0.014). We investigated whether the respondents ever had sex, whether he/she is sexually active and whether/or not they use protection during sexual intercourse. Pearson's chi-squared test was used to assess for the relationship. Table 4.9 below highlights the variables assessing risk practices and the relationship between levels of responses of use of HIVST kits.

Table 4.9: Relationship between Risky Sexual Practices & Use of HIVST Kits

Characteristic	HIVST-ve, n = 188	HIVST+ve, n=83	Statistical significance
Ever Had Sex			
No	74 (40%)	21 (26%)	X^2 (1) = 4.5245
Yes	111 (60%)	61 (74%)	p = **0.033**
Sexual Activeness			
No	105 (56%)	34 (41%)	X^2 (1) = 4.353
Yes	82 (44%)	48 (59%)	p = **0.037**
Used Protection			
No	47 (39%)	36 (59%)	X^2 (1) = 4.353
Yes	75 (61%)	25 (41%)	p = **0.014**
Have Multiple Sex Partners			
No	112 (86%)	54 (86%)	X^2 (1) = 0
Yes	18 (14%)	9 (14%)	p > 0.9

Key: HIVST +/-ve: HIVST use/not used, X^2 (): Chi-Square value with corresponding degree of freedom

4.4 Likelihood ratio test (LRT) statistics to determine variables for multilevel modeling from unadjusted models.

Based on the results from Pearson's chi-square test of independence and Fisher's exact test, a total of 26 variables were selected for unadjusted models to determine which variables to advance to the simple models. The variables without response in one of the levels of HIVST variable were dropped to avoid skewing the model results. The omitted variables were confidence in HIVST testing and interpreting results, testing with partner, counselled after test, charged for HIVST, ease in understanding HIVST use instructions, pre-counselling before HIV test and willing to share HIV results with partner. Religion was also omitted due to the extremely large observations seen on one category (Christian). The course variable was set as the random effects covariate in the model, hence was not fitted as a fixed effect.

The covariates that showed significant association with use of HIVST were age, those who were married, students in year 2, 4 and 6 of study, those who were aware of PREP, those who responded to have had sex before, those who reported being sexually active, those who used protection during sex and individuals who were linked to a counsellor after testing for HIV. Apart from those who use protection during sex, all the mentioned significant covariates were associated with increased odds of HIVST use. Highest odds of HIVST use were observed in the year of study covariate, with higher odds for every increase in one year of study.

The models with better fit when compared to the intercept only model using likelihood ratio test statistic were age, year of study, awareness of PREP, having ever had sex, using protection during sex and being linked to counsellor after testing for HIV. When tested against the Akaike information criterion (AIC) value for the intercept only model (338), the intercept only model had a better fit compared to several models such as gender, marital status, department, residency, HIV as a serious disease, awareness that if HIV positive can live a normal life if on HAART, fear of partner reaction if HIV result is positive, discussing those with HIV negatively, buying meat from HIV+ butcher, if HIV discordant relationships can work , if HIV+ couples can get a HIV negative child and awareness of '*Chukua Selfie'* campaign.

Only variables that failed to perform better in both AIC and LRT were dropped and did not advance to the adjusted models. The dropped covariates based using this criterion were marital status, department, student residency, HIV as a serious disease, awareness that if HIV positive can live a normal life if on HAART, fear of partner reaction if HIV result is positive, discussing those with HIV negatively, buying meat from HIV+ butcher, if HIV discordant relationships can work, if HIV+ couples can get a HIV negative child and awareness of '*Chukua Selfie'* campaign. Gender was retained for being a potential confounder in use of HIVST kit. Table 4.10 below highlights the variables, odds ratio from unadjusted models and their 95% confidence interval, p-value for the unadjusted model, AIC value as a comparison with the intercept only model (AIC 338), and log-likelihood test comparing model performance to that of intercept only model.

Table 4.10: Selection of Model Variables Using LRT &AIC Criteria

Characteristic	Unadjusted OR	Std.Error	95% CI	p-value	AIC	Log likelihood	LR Chi^2	d.f	p-value
Age	1.33	0.0779	1.14,1.54	**<0.001**	325	-159.94	14.76	1	**<0.001**
Gender									
Male	1	-	-	-	342	-167.31	0.036	1	0.849
Female	1.02	0.2625	0.61,1.71	>0.9					
Marital status									
Single	1	-	-	-	338	-165.34	3.975	2	0.137
In a Relationship	0.46	1.1037	0.05,4.01	0.5					
Married	9.22	1.1262	1.01,83.8	**0.049**					
Department									
Dentistry	1		-	-	341	-164.71	5.237	3	0.155
Medicine	1.31	0.5319	0.46,3.75	0.6					
Nursing	2.64	0.6185	0.78,8.93	0.12					
Pharmacy	2.27	0.612	0.68,7.56	0.2					
Year of Study									
1	1	-	-	-	326	-160.7	14.3	5	**<0.001**
2	9.12	1.073	1.11,74.8	**0.039**					
3	4.95	1.091	0.58,42.0	0.14					
4	15.8	1.062	1.97, 126	**0.009**					
5	16.2	1.074	1.98, 133	**0.009**					
6	42.5	1.176	4.25, 426	**0.001**					
Residency									
Inside School	1	-	-	-	342	-167.16	0.329	1	0.567
Outside School	1.15	0.2706	0.68,1.95	0.6					
Is HIV a Serious Disease?									
No	1	-	-	-	339	-164.82	4.021	1	0.142
Yes	0.22	1.2318	0.02,2.45	0.2					
PREP Awareness	1	-	-	-	333	-162.95	8.75	1	**0.003**

Aware									
Not Aware	9.44	1.035	1.24,71.7	**0.03**					
Normal Life with HIV if on HAART									
No	1	-	-	-	340	-166.47	1.716	1	0.19
Yes	0.44	0.6466	0.12,1.55	0.2					
Ever had Sex									
No	1	-	-	-	331	-161.73	11.91	1	**0.038**
Yes	1.89	0.2947	1.06,3.36	**0.031**					
Sexually activeness									
No	1	-	-	-	334	-152.57	1.633	1	0.089
Yes	1.71	0.2672	1.01,2.88	**0.046**					

Characteristic	**Unadjusted OR**	**Std.Error**	**95% CI**	**p-value**	**AIC**	**Log likelihood**	**LR Chi^2**	**d.f**	**p-value**
Used Protection									
No	1	-	-	-	234	-162.475	11.32	1	**0.001**
Yes	0.44	0.3187	0.24,0.83	**0.011**					

Table 4.10 Continued: Selection of Model Variables Using LRT &AIC Criteria

Characteristic	Unadjusted OR	Std.Error	95% CI	p-value	AIC	Log likelihood	LR Chi^2	d.f	p-value
Have Multiple Sex Partners									
No	1	-	-	-	251	-160.74	1.832	1	0.321
Yes	1.01	0.44029	0.43,2.39	>0.9					
HIV infection from Saliva of HIV infected person									
No	1	-	-	-	337	-164.24	3.435	1	0.132
Yes	1.02	0.26479	0.61,1.72	>0.9					
Ashamed if Family Member has HIV.									
Strongly disagree	1	-	-	-	268	-160.01	1.782	1	0.821
Neutral	1.14	0.3381	0.59,2.21	0.7					
Agree	1.28	0.5152	0.47,3.52	0.6					
Strongly agree	1.93	0.7986	0.40,9.24	0.4					
Fear of Partner's Reaction to Positive HIV Result									
No	1	-	-	-	341	-167.24	0.179	1	0.672
Yes	0.78	0.6411	0.22,2.75	0.7					
Stigma: Discussing those with HIV Negatively									
No	1	-	-	-	338	-160.42	1.987	1	0.321
Yes	1.13	0.3174	0.60,2.10	0.7					
Buy Meat from HIV+ Butcher									
No	1	-	-	-	339	-161.79	3.092	1	0.154
Yes	0.88	0.2815	0.50,1.52	0.6					
HIV Discordant Relationships Work									
No	1	-	-	-	339	-162.34	5.425	1	0.197
Yes	0.98	0.29179	0.56,1.74	>0.9					
HIV+ Couple can get HIV- Child									
_No	1	-	-	-	340	-166.86	0.925	1	0.336
Yes	0.63	0.5114	0.23,1.70	0.4					
Aware of '*Chukua Selfie'*									
No	1	-	-	-	340	-166.78	1.086	1	0.297
Yes	1.29	0.2665	0.77,2.18	0.3					
Linked to Counsellor after HIVST									
No	1	-	-	-	47	-151.33	1.19	1	**0.021**

Yes	6.94	0.8602	1.29,37.5	**0.024**

Key: 1: reference group/category, OR: Odds Ratio, Std.Error: Standard Error, 95% CI: 95% Confidence Interval (lower limit, upper limit), AIC: Akaike information criterion, LR Chi^2: Likelihood Ratio Chi-Square value, d.f: degree of freedom

4.5 Sociodemographic, Institutional, and individual factors associated with the use of HIVST.

4.5.1 Sociodemographic factors associated with HIVST.

The sociodemographic model showed an increased 1.33 odds of using HIVST for every increase in one year of age (OR: 1.33; CI: 1.14-1.54; p-value < 0.001) as shown in table 4.11 below. Gender and relationship status were not significantly associated with use of HIVST kits, despite those married showing significant association when compared to those not in a relationship from the unadjusted model (OR: 9.22; CI: 1.01, 83.8; p-value 0.049) as shown in table 4.11 below. Table 4.11 below highlights sociodemographic variables that passed unadjusted model performance, their unadjusted and adjusted odds ratios, corresponding confidence intervals and p-values.

Table 4.11: Sociodemographic factors associated with HIVST

Characteristic	Unadjusted			Adjusted		
	OR[1]	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**
Gender_Male	1	-	-	-	-	-
Female	1.02	0.61, 1.71	>0.9	1.05	0.61, 1.81	0.8
Age	1.33	1.14, 1.54	**<0.001**	1.30	1.12,1.51	**<0.001**
Not in a relationship	1	-	-	-	-	-
In a relationship	0.46	0.05, 4.01	0.5	0.46	0.05, 4.33	0.5
Married	9.22	1.01, 83.8	**0.049**	3.51	0.33, 37.6	0.3

Key: 1-reference category

4.5.2 Institutional level factors associated with HIVST.

When institutional factors were fitted to a single model with the variables department, year of study and residency of student, several levels of the variables turned significant. Those in the department of nursing were 4.67 times more likely to have used HIVST (95% CI: 1.29-16.9; p-value 0.019) (table 4.12) compared to those in the department of Dentistry.

Students in year 2 were 12.6 times (95% CI: 1.50-105; p-value 0.02) (table 4-12) more likely to have used HIVST compared to students in year one. Students in year four were 20.1 times (95% CI: 2.41-167; p-value 0.006) (table 4.12) more likely to have used HIVST compared to those in year one. Students in years 5 and 6 were 22.2 times (95% CI: 2.60-189; p-value 0.005) (table 4.12)

and 55 times (95% CI: 5.46-554; p-value < 0.001) (table 4-12) more likely to have used HIVST compared to those in year one respectively.

The covariate department was dropped from the model for violating the multi-collinearity assumption. There was an increase in odds of association with increase in the level of study. Table 4.12 below highlights institutional variables that passed unadjusted model performance, their unadjusted and adjusted odds ratios, corresponding confidence intervals and p-values.

Table 4.12: Institutional factors associated with HIVST.

Characteristic	Unadjusted			Adjusted		
	OR[1]	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**
Course_Dentistry	1	-	-	1	-	-
Medicine	1.31	0.46, 3.75	0.6	1.27	0.43, 3.71	0.7
Nursing	2.64	0.78, 8.93	0.12	4.67	1.29, 16.9	**0.019**
Pharmacy	2.27	0.68, 7.56	0.2	2.15	0.62, 7.48	0.2
Year of study_1	1	-	-	1	-	-
2	9.12	1.11, 74.8	**0.039**	12.6	1.50, 105	**0.02**
3	4.95	0.58, 42.0	0.14	6.86	0.78, 60.5	0.083
4	15.8	1.97, 126	**0.009**	20.1	2.41, 167	**0.006**
5	16.2	1.98, 133	**0.009**	22.2	2.60, 189	**0.005**
6	42.5	4.25, 426	**0.001**	55	5.46, 554	**<0.001**
Reside in university hostels	1	-	-	1	-	-
Reside outside university hostels	1.15	0.68, 1.95	0.6	1.3	0.72, 2.33	0.4

4.5.3 Individual level factors

Use of protection during sexual intercourse and last time an individual tested for HIV were the only statistically significant factors. Those who used protection during sexual intercourse were 64% less likely to have use HIVST (OR: 0.36; 95% CI: 0.17 – 0.73; p-value: 0.005) (table 4.13). Compared to individuals who tested for HIV within the last three months, those who tested for HIV more than one year ago had 80% reduced odds of using HIVST (OR: 0.2; 95% CI: 0.07 – 0.55; p-value < 0.002) (table 4.13). Significant variables in the unadjusted models were sexually activeness, used protection, and ever had sex and last time HIV test done. Table 4.13 below highlights individual level variables that passed unadjusted model performance, their unadjusted and adjusted odds ratios, corresponding confidence intervals and p-values.

Table 4.13: Individual factors associated with HIVST

Characteristic	Unadjusted			Adjusted		
	OR[1]	95% CI[1]	p-value	OR[1]	95% CI[1]	p-value
Sexually active_No	1	-	1	-	-	-
Yes	1.71	1.01, 2.88	**0.046**	1.8	0.54, 3.07	0.6
Protection_No	-	-	-	-	-	-
Yes	0.44	0.24, 0.83	**0.011**	0.36	0.17, 0.73	**0.005**
Multiple sex partner_No	-	-	-	-	-	-
Yes	1.01	0.43, 2.39	>0.9	0.64	0.24, 1.73	0.4
Sex_No	-	-	-	-	-	-
Yes	1.89	1.06, 3.36	**0.031**	2.92	0.29,29.0	0.4
Last test_Last 3 months	-	-	-	-	-	-
Last 6 months	0.6	0.29, 1.25	0.2	0.81	0.26, 2.55	0.7
More than 1 year ago	0.17	0.09, 0.33	**<0.001**	0.20	0.07, 0.55	**0.002**
Seriousness_No	1	-	-	1	-	-
Yes	0.22	0.02, 2.45	0.2	0.74	0.05,11.5	0.8
Contact with saliva No	1	-	-	1	-	-
Yes	1.02	0.61,1.72	>0.9	0.53	0.23,1.23	0.14
Shame 0				1		
2	1.14	0.59,2.21	0.7	1.07	0.4,2.82	0.9
3	1.28	0.47,3.52	0.6	1.61	0.4,6.44	0.5
4	1.93	0.4,9.24	0.4	2.13	0.19,23.8	0.5

4.6 Predictors of HIVST among undergraduate students in UoN-FHS; Combined Model

In the final adjusted model, there was 1.53 more odds for having used HIVST before with every unit increase in age (95% CI: 1.03 – 2.27; p-value 0.034) (table 4.14). Age was also significant in the unadjusted model with 1.33 odds for every unit increase in age (95% CI: 1.14 – 1.54; p-value <0.001) (table 4.14). Respondents who reported to use protection during sex were 64% less likely to have used HIVST compared to those who do not use protection during sex (OR: 0.36; 95% CI: 0.14 – 0.95) (table 4.14). The variable 'used protection' was also significant in the unadjusted model with 56% less odds of HIVST (OR: 0.44; 95% CI: 0.24 – 0.83; p-value 0.011) (table 4.14). Those who tested more than one year ago had 79% less odds of having using HIVST compared to those who tested within the last three months (OR: 0.21; 95% CI: 0.07 – 0.66; p-value 0.007) (table 4.14). The trend for association between last time tested for HIV and HIVST use was also seen in the simple unadjusted model with those who tested more than one year ago having 84% less odds of using HIVST (OR: 0.16; 95% CI: 0.08 – 0.32; p-value < 0.0001) (table 4.14). Other variables that were significant in the unadjusted model alone were: year of study (OR: 1.48; 95% CI: 1.20 – 1.84; p-value < 0.0001) (table 4.14), those who reported to be sexually active (OR: 1.71; 95% CI:

1.01 – 2.88; p-value 0.046) (table 4.14), and those who reported to have ever had sex (OR: 1.89; 95% CI: 1.06 – 3.36; p-value 0.031) Table 4.14 below highlights the variables, odds ratios, and the associated confidence intervals in both simple/unadjusted and adjusted models.

Table 4.14: Predictors of HIVST among Undergraduate students in UoN-FHS

Characteristic	Unadjusted			Adjusted		
	OR[1]	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**
Gender						
Male	1	-	-	1	-	-
Female	1.02	0.61, 1.71	>0.9	1.72	0.67, 4.43	0.3
Age	1.33	1.14, 1.54	**<0.001**	1.53	1.03, 2.27	**0.034**
Relationship status						
Single	1	-	-	1	-	-
Relationship	0.65	0.05, 4.03	0.5	0.12	0.06, 0.31	**0.041**
Married	6.95	0.71, 67.8	0.10	2.47	0.17, 35.7	0.5
Year_of_study	1.48	1.20, 1.84	**<0.001**	0.97	0.60, 1.57	0.9
Sexually Active						
Not sexually active	1	-	-	1	-	-
Sexually active	1.71	1.01, 2.88	**0.046**	0.97	0.34, 2.74	>0.9
Used Protection						
No	1	-	-	-	-	-
Yes	0.44	0.24, 0.83	**0.011**	0.36	0.14, 0.95	**0.039**
Have Multiple Sex Partners						
No	1	-	-	1	-	-
Yes	1.01	0.43, 2.39	>0.9	0.44	0.10, 1.94	0.3

Table 4.14 Continued: Predictors of HIVST among Undergraduate students in UoN-FHS

Characteristic	Unadjusted			Adjusted		
Ever Had Sex	**OR[1]**	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**
No	1	-	-	1	-	-
Yes	1.89	1.06, 3.36	**0.031**	3.04	0.27, 34.6	0.4
Last time did HIV Test						
Last 3 months	1	-	-	1	-	-
Last 6 months	0.59	0.28, 1.21	0.15	1.27	0.35, 4.59	0.7
More than 1 year ago	0.16	0.08, 0.32	**<0.001**	0.21	0.07, 0.66	**0.007**
Fear of Partner's Reaction to Positive HIV Result						
No	1	-	-	1	-	-
Yes	0.78	0.22, 2.75	0.7	0.11	1.01, 1.20	**0.04**

Key: - 1: reference group/category, OR: Odds Ratio, 95% CI: 95% Confidence Interval (lower limit, upper limit)

Model assumptions

All model assumptions were met when the combined model was fitted with course, year of study and residence variables.

Table 4.15: Multicollinearity; combined model

Variable	Variance inflation factor	Degree of freedom	Corrected VIF VIF^(1/(2*Df))
Gender	1.170	1	1.082
Age	2.339	1	1.529
Marital Status	1.077	1	1.038
Year of study	2.282	1	1.511
Residence	1.147	1	1.071
Sexually activeness	1.252	1	1.119
Used Protection	1.132	1	1.064
Have Multiple sex partners	1.210	1	1.099
Ever had Sex	1.130	2	1.063
Last time HIV test done	1.363	1	1.080
Is HIV a Serious disease?	1.075	1	1.037
HIV infection from Saliva of HIV infected person	1,093	1	1.045

Table 4.15 above shows all the variables reported no (1) or moderate (1-5) multicollinearity. The highest variance was reported in the Age (2.339) and year of study (2.282) covariates. These values were still below 5, which is the required cut off point. The table also shows no violation of multicollinearity

When the model residual values were potted against the predicted values, a parallel difference was noted across all the points and indication that there was constant spread along the vertical axis hence constant variance. This is an indication that the linearity and homoscedasticity assumptions were not violated by the data. Figure 4.4 below highlights the homoscedasticity plot of model residual values against the predicted values

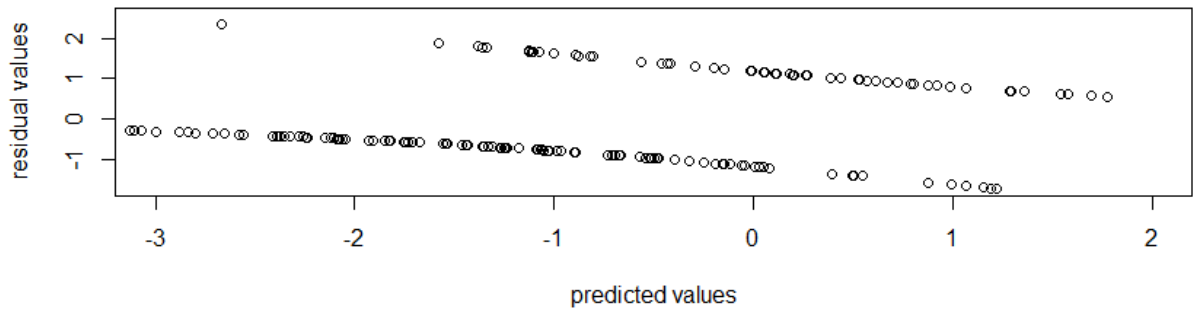

Figure 4.4: Homoscedasticity; combined model

CHAPTER V
DISCUSSION

5.1 Frequency of use of HIVST use among Health Sciences Undergraduate students

HIV self-testing represents a valuable tool for individuals to take charge of their own health and make informed decisions as depicted by a South African study on HIV self-testing and self-stigma depicting how it empowered and reduced stigma among health sciences students at University of Limpopo (Nkuna and Nyazema, 2016). By examining the frequency of use of the HIVST kit we understand more the extent to which students are embracing HIVST to manage their health. Understanding the variations in HIVST across course types and years of study enables us to contextualize our study findings within Faculty of Health Sciences, where different courses and academic years may influence HIVST behavior differently. Embracing HIVST among health sciences undergraduate students could be a strategic move to enhance HIV prevention and management efforts within universities. Understanding the use and variations in HIVST utilization across different courses and academic years within the Faculty of Health Sciences allows for a nuanced appreciation of how different academic environments influence HIVST behaviors.

Nearly one-third of the students included in this study had used HIV self-testing kits. This is much higher than the uptake of HIV self-testing found in a Nigerian university of 9.0% (Iliyasu *et al.*, 2020). Another study done in University of KwaZulu Natal in South Africa on undergraduate students had nearly same usage with our study showing a HIVST usage of 37.9% (Ndabarora and Mchunu, 2014). It is important for undergraduate university students particularly those in the faculty of health sciences to test for HIV primarily because they fall within the age bracket that is most affected by the HIV epidemic. According to the UNAIDS data, young people aged 15-24 years' account for a significant proportion of new HIV infections globally, emphasizing the susceptibility of this demographic (UNAIDS, 2021). Moreover, the university environment could expose students to factors such as new sexual partnerships and peer pressure, which could potentially increase the risk of HIV transmission (UNAIDS, 2022). Encouraging HIV self-testing (HIVST) is crucial as it fosters early diagnosis, linkage to care, and ultimately curtails the further spread of the virus within this vulnerable population (WHO, 2019). Furthermore, understanding

the determinants of HIVST utilization among this youthful university population allows for the creation of tailored interventions and strategies to enhance HIV testing rates which is pivotal in managing, reducing, and potentially eradicating the transmission of HIV within institutions of higher learning and the larger community. The knowledge of determinants and HIVST usage will contribute invaluable knowledge towards the global efforts in achieving the UNAIDS 95-95-95 targets, thereby moving closer to ending the AIDS epidemic as a public health threat by 2030.

While there was no statistically significant association between the department (X^2 (1 degree of freedom) = 3.427;p-value= 0.33) or the course (X^2 (1 degree of freedom) = 4.763;p-value= 0.313) the student is in with the use of HIV self-testing kits, there were notable variations in usage across the four departments within the Faculty of Health Sciences with nursing department recording the highest use of HIVST utilization at 43.8%, while dental department had the lowest usage at 21.7 %. This contradicts a study done in Zimbabwe across tertiary level colleges to assess youth access to HIV testing through HIVST which found out that a college of nursing was among the ones found to have the lowest usage of HIVST (McHugh *et al.*, 2023). The comparisons between our study setup and those seen in University of KwaZulu Natal in South Africa highlight the regional variability in HIVST uptake and emphasize the importance of considering local findings when interpreting usage rates. These variations of usage of HIVST across the four faculties suggest that determinants beyond the department of study may be influencing students' decisions to adopt HIVST plus they emphasize the importance of considering unique dynamics and contextual factors that can be tailored to HIVST promotion strategies being cognizant of the specific influences and barriers experienced by different student populations within the faculty of health sciences.

5.2 Strength and Significance of Variations in HIVST use across Course-type and Year-of-study among the Undergraduate Students

The study revealed interesting variations in HIV self-testing utilization across different course types and year-of-study groups. For instance, students in the Nursing course exhibited higher odds ratio (OR) of HIV self-testing utilization compared to students in Dentistry and Medicine courses, although this association was not statistically significant after adjustment. Similarly, year-of-study

had a notable impact on self-testing behavior. In the adjusted model, students in the 6th year of study had significantly higher odds of utilizing HIV self-testing compared to those in the 1st year. This observed variation can be attributed to several factors that align with the progress in their academic and personal lives. Older students, being in their sixth year, are likely more mature and may have accumulated more knowledge and awareness regarding the risks associated with HIV and the benefits of self-testing. This maturity and enhanced awareness could drive them towards adopting preventative measures such as HIV self-testing (Ritchwood *et al.*, 2019). Additionally, students in advanced years of study might be engaged in marital or stable relationships, which could further influence their approach towards sexual health and HIV testing. Being in a committed relationship often necessitates a mutual understanding and responsibility towards each other's health, making HIVST a practical choice for them (Mulubwa *et al.*, 2019). Furthermore, older students, due to their extended exposure to the health sciences curriculum, are likely more informed and have easier access to HIV self-testing kits, possibly enhancing their utilization rates. Their advanced academic standing allows them to appreciate the significance of early HIV detection and management, aligning with the global strategies aimed at controlling the spread of the virus (WHO, 2019).This is similar to a study done on students in a technical and vocational college in South Africa to assess the acceptability and perceived use of HIV self-testing among them which also showed variation in HIVST utilization across the various levels of study (Teffo, Mndzebele and Mokgatle, 2023). However our findings on students at various levels of study in their academic year contradict those found in a study among undergraduate students in northern Nigeria assessing their acceptability of HIV self-testing which found that students between second to sixth year of study were less likely to use HIV self-testing (Iliyasu *et al.*, 2020). These findings suggest that both the academic program and the progression of one's academic journey may influence self-testing behavior among health sciences undergraduate students as shown in a similar systematic review and meta-analysis of acceptance and associated factors of HIV testing among college students in China which showed a very high usage (82.6%) of HIVST use among students

doing a course in medical specialty (Liao *et al.*, 2023). The discrepancies seen between our study and that done in northern Nigeria emphasize the multifaceted nature of self-testing behavior and the potential influence of sociodemographic factors. The study conducted in China by Liao et al emphasizes the influence of academic programs on self-testing. The higher odds of HIVST utilization among Nursing students and those in advanced academic years suggest a potential influence of curriculum exposure and increased health knowledge, underscoring the role of educational interventions in promoting HIVST. However, the variations and discrepancies observed in the study also underscore the need for a comprehensive understanding of the determinants that influence HIVST behaviors beyond academic scope.

5.3 Socio-demographic, Individual and Institutional factors associated with use of HIVST among Undergraduate Students

The study assessed various determinants associated with HIV self-testing utilization. Notably, age emerged as a significant determinant, with older students having higher odds of self-testing. This might reflect a greater awareness of the importance of regular HIV testing among older students or a shift in attitudes towards self-testing as individuals' progress through their academic journey. These findings are very similar to a study that was done in a private university in Nigeria among its undergraduate students seeking to assess predictors of HIV testing uptake among the students which found a significant association between increasing age and willingness to do an HIV test, with ages of 21 years and above being found to be associated with an increased odd of having done an HIV test (Abiodun *et al.*, 2014). However, a study in South Western region of Uganda assessing prevalence and factors associated with utilization of HIVST among its undergraduate students found no significant statistical association between age and utilization of HIVST (Namande *et al.*, 2021).The study population in Uganda encompassed a generalized undergraduate student body from all the faculties and was not specifically focused on health sciences students. This distinction is crucial. Students enrolled in health sciences faculties, such as those in our study at the University of Nairobi, are exposed to a curriculum rich in health-related knowledge, including comprehensive

information about HIV/AIDS, its transmission, prevention, and the significance of early detection and management. Such exposure likely influences their attitudes and behaviors towards HIV self-testing (HIVST), making them potentially more receptive and proactive in utilizing HIVST as a preventative measure. On the other hand, students from non-health-related faculties may not receive such in-depth health education as part of their regular curriculum, possibly affecting their awareness, perception, and utilization of HIVST. Their educational background and exposure to health information could influence their risk perception, accessibility, and the decision to utilize HIVST services, thus explaining the variation in HIVST utilization across different student populations (Kelvin *et al.*, 2018).Gender did not emerge as a significant factor as opposed to a meta-analysis that was done to assess acceptance and associated factors in China among students in a public college that demonstrated male students being more willing to accept HIV testing than their female counterparts (Liao *et al.*, 2023). The significant influence and variations of age underscores the importance of developing interventions to address the evolving needs of different age groups among youths and suggests that the impact of age on self-testing behavior may vary across the different academic courses found in faculties of Health sciences. The influence of age could also be attributed to a heightened awareness of the significance of regular HIV testing among older students or a transformation in attitudes towards self-testing as students' advance in their academic journey.

There was a significant association between marital status and HIVST utilization specifically, within the "married" category where there was a significantly higher proportion of individuals who reported using HIVST kits (4.9%) compared to those who had not used HIVST (0.5%). This association is noteworthy, as it suggests that marital status might be a relevant factor influencing HIVST utilization among students as in a study done in Uganda among female university students assessing factors leading to utilization of HIVST where being married or living with a partner was associated with HIVST utilization (Segawa *et al.*, 2022). However, a different study in Rwanda among male clinic attendees demonstrated no association between HIVST utilization and marital

status (Dzinamarira *et al.*, 2020). Our findings therefore suggest that marital status may indeed be a relevant factor influencing HIVST utilization among undergraduate students although the Rwandan study showed the influence of marital status on HIVST utilization may vary across different undergraduate student populations. Being married or in a committed relationship could potentially influence the students' perceptions, attitudes, and practices regarding HIVST, possibly due to increased awareness or sense of responsibility towards one's partner and family.

The use of protection was another significant factor, with students who reported using protection having lower odds of HIV self-testing. This result raises questions about the perceptions and motivations behind HIV self-testing. It could suggest that students who consistently practice safe sex may perceive a lower risk of HIV and, therefore, may be less inclined to self-test. These findings concur with a study that was done in Ethiopia among undergraduate students at Addis Ababa University which showed students who consistently used condoms had a lower odds of testing for HIV (Woldeyohannes *et al.*, 2017). The observed link between protection use and decreased HIVST uptake prompts a deeper exploration of students in the faculty of health sciences perceptions and motivations regarding HIV testing. It raises questions about whether the students who consistently practice safe sex perceive a reduced risk of HIV and, consequently, may be less motivated to engage in self-testing. These findings show the importance of fostering a more comprehensive understanding and awareness of HIV risk among university students, even among those who practice safe sex consistently and whilst the use of protection is crucial in reducing the risk of HIV transmission, it should not harbor a sense of complacency that detracts from other HIV preventative measures such as regular HIV testing.

There was a statistically significant association between the timing of the last HIV test and the use of HIVST. Among students who reported having tested for HIV within the last three months, a substantial proportion (39.0%) had used HIVST. This indicates that recent HIV testers were more likely to embrace self-testing as an additional method for HIV screening and this is a similar finding that was found in male students who engage in sex with other males in a study carried out

in China assessing the benefits and potential harm of HIVST which found out that first timers and those who had tested for HIV less than three months prior were more likely and more willingly to embrace HIVST (Guo *et al.*, 2015). These congruent findings provide solid evidence that recent HIV testers exhibit a greater willingness to adopt HIVST, highlighting the relevance of our study's findings. The results also showed a different trend among students where a majority (66.5%) reported having not used HIVST having reported that they had tested for HIV more than one year ago. The findings suggest that as time elapsed since the last HIV test increases, there was a reduced inclination to adopt HIVST. This however contradicts a cross-sectional study done on female university students to asses factors associated with increased utilization of HIV self-testing in Uganda which showed higher use of HIVST with longer HIV testing time (Segawa *et al.*, 2022). This discrepancy emphasizes the complex nature of HIVST behavior and highlights the need for a different understanding that goes beyond statistical associations and this trend might reflect a hesitancy or resistance to transitioning from traditional testing methods to self-testing, which could be influenced by factors such as perceived accuracy, convenience, or confidence in the HIVST process. These findings also underscore the appeal of self-testing among recent HIV testers, suggesting that they are more likely to view it as an additional method for HIV screening. Factors contributing to this hesitancy could include perceptions regarding test accuracy, convenience, or confidence in the self-testing process.

The analysis explored whether being sexually active (having engaged in sexual intercourse) was associated with HIVST utilization with the results showing that sexually active individuals had 71% higher odds of HIVST utilization in the unadjusted model (p-value = 0.046). This finding suggests a potential link between sexual activity and the inclination to use HIVST kits. However, this association lost significance in the adjusted model (p-value > 0.05). This signifies that when considering the influence of additional variables such as age, academic program, and attitudes related to stigma, the relationship between sexual activity and HIVST utilization among undergraduate students becomes less pronounced. Therefore, after considering other factors, there

was no significant relationship between sexual activity and HIVST utilization among undergraduate students. This is in contrast to two studies one done in China and the other in Kilimanjaro area of Tanzania on college students which showed association or increased utilization of HIVST with sexual activeness (Vara *et al.*, 2020; He *et al.*, 2023). The discrepancy in findings underscores the complexity of HIVST behavior, which may vary across different populations and settings. This finding suggests a nuanced approach in promoting HIVST utilization. While sexual activity could be a consideration in HIVST initiatives, it is crucial to recognize and address the multitude of factors that influence individuals' decisions to adopt HIVST. Understanding that the inclination to use HIVST is not solely dependent on sexual activity allows for the development of more comprehensive and tailored strategies that consider a broader array of influences such as age, academic engagement, and perceptions related to stigma.

Students who reported using protection during sexual intercourse were 64% less likely to have used HIVST (adjusted OR: 0.36; 95% CI: 0.17 – 0.73; p-value = 0.005). This association was also significant in the unadjusted model, with individuals using protection having 56% reduced odds of HIVST utilization (unadjusted OR: 0.44; 95% CI: 0.24 – 0.83; p-value = 0.011). This result indicates that students who practice safe sex may be less inclined to use HIVST, possibly due to a perceived lower risk of HIV which contradicts a study done in Congo on university students to check acceptability of HIVST that found association between condom use and HIVST use (Izizag *et al.*, 2018). This discrepancy shows the complex interplay of factors influencing HIVST behavior and emphasizes the need to consider the unique dynamics of our study population. While safer sexual practices are commendable, our findings suggest that students who consistently use protection may perceive themselves as having a lower risk of HIV, potentially leading to reduced interest in additional screening methods like HIVST. This finding highlights a potential barrier to the broader adoption of HIVST among health sciences students. The perception of reduced HIV risk associated with consistent protection use, while promoting positive sexual health practices, may limit the perceived necessity of regular HIV testing, including self-testing. While using

protection can significantly reduce the risk of HIV transmission, it does not eliminate the need for regular HIV testing, including self-testing.

The influence of stigma was also evident in the findings. Students who strongly agreed with feelings of shame or fear of reactions related to getting a positive HIV test had higher odds of self-testing. This may indicate that students who are more open and accepting of their HIV status or are less concerned about potential negative reactions are more likely to self-test. This finding challenges the conventional assumption that stigma universally acts as a deterrent to HIV testing. These findings contradict those of a study done on university students residing in Durban, South Africa which identified fear of stigma as a potential barrier to HIV self-testing (Ndabarora and Mchunu, 2014). This disparity shows the aspect of stigma and its impact on HIVST behavior. With these findings, it is evident that the relationship between stigma and HIVST is intricate and complex. This suggests that for some individuals, the privacy and confidentiality afforded by HIVST might mitigate the deterrent effects of stigma, enabling them to get tested despite their feelings of shame or fear. It emphasizes the multifaceted influence of stigma on HIVST behavior, suggesting that self-testing could be a crucial tool in encouraging HIV testing among those who experience feelings of stigma. HIVST offers a private and confidential means of testing, which might appeal to those who fear judgment or discrimination in more public or conventional testing settings. Strategies of HIV testing should be adaptable and responsive to the specific nuances of how stigma influences HIV testing behaviors within particular populations of university student populations.

Insight from all the objectives

In the final model, which considered all factors together, several predictors remained significant. This included age, with older students still having higher odds of self-testing. This shows older students consistently exhibited higher odds of self-testing. This trend suggests that as students' progress in their academic journey, they may become more aware of the importance of regular HIV testing, therefore public health strategies should consider age-specific interventions that

promote the benefits of regular HIV testing, including HIVST, across different age groups and academic levels.

The use of protection remained significant, indicating that consistent safe sex practices are associated with a decreased likelihood of self-testing. Students who reported practicing safe sex had decreased odds of utilizing HIVST. This observation raises questions about the motivations and perceptions surrounding self-testing therefore public health intervention should aim to promote HIVST as a necessary component of comprehensive sexual health education, regardless of the consistency of protection use.

Furthermore, engaging in sexual activity was associated with higher odds of self-testing, suggesting that sexually active students may be more attuned to their HIV risk and the need for testing. This suggests that sexually active students may be more aware of their HIV risk and the importance of testing, potentially reflecting an increased awareness of health practices among them. These findings highly correlate with a study done in Tanzania among undergraduate medical students in Kilimanjaro region where medical students who were sexually active had higher odds of using HIVST and this finding was significant (Vara *et al.*, 2020). It was also similar to a study in Democratic republic of Congo among sexually active university students and students with multiple partners in a peri-urban area were found to have a higher acceptability and uptake of HIVST (Izizag *et al.*, 2018). This suggests that sexual activity may enhance the perceived relevance and urgency of HIV testing, including self-testing.

5.4 Conclusion

Our study found that 30.5% of undergraduate students in the Faculty of Health Science at the University of Nairobi have utilized HIV Self-Testing (HIVST). This usage, notably higher than some regional counterparts, underscores the variations in health-seeking behaviors in different contexts. These findings highlight the pivotal role of HIVST in empowering health sciences students with knowledge of their HIV status. Furthermore, this uptake aligns with broader efforts to achieve the 95-95-95 UNAIDS targets, emphasizing the importance of HIVST in prevention

and care strategies. The study also revealed that academic progression and age are pivotal determinants of HIVST utilization among health sciences undergraduate students at the University of Nairobi. Being advanced academically and older age were associated with a higher inclination towards HIVST, possibly due to enhanced awareness, maturity, and evolving attitudes towards HIV testing. Students' perceptions of their risk of acquiring HIV influenced their HIVST choices, with those practicing safe sex showing less inclination due to perceived lower risk. The association between stigma and HIVST in this cohort was multifaceted; rather than deterring students, higher stigma feelings increased HIVST odds, highlighting the intricate dynamics of HIV self-testing. Moreover, marital status significantly impacted HIVST decisions, with married students showing a higher uptake, pointing to relationship dynamics as a key factor in health-seeking behaviors.

5.5 Recommendations from the study

1. Tailored HIV testing and prevention interventions should consider the significant influence of age and academic progression on HIVST utilization. Specific campaigns could be designed in various forms such as seminars, workshops, and digital awareness campaigns. For instance, seminars and workshops could be organized within faculties, ensuring that they are precisely tailored to resonate with the unique needs and experiences of each academic year and course type. Engagement through digital platforms, such as university websites and social media, could also be harnessed to reach a broader student audience, ensuring messages are more accessible. For younger students or those in the early years of study, who showed lower HIVST uptake, campaigns might include basic HIV education, benefits of early testing, and debunking myths around HIVST.
2. Address the role of stigma in HIVST; given the intricate and complex relationship between stigma and HIVST, there's a need for initiatives aimed at reducing HIV-related stigma and enhancing acceptance. Universities should promote a culture of understanding and acceptance around HIV, potentially using peer-led campaigns or workshops to combat misconceptions and foster a more inclusive environment.

3. Promote the benefits of regular HIV testing; the reduced inclination to adopt HIVST as the time elapsed since the last HIV test increases suggests the need for continual reminders about the importance of regular HIV testing. Institutions of higher learning should establish reminders, perhaps semi-annually, emphasizing the benefits of regular testing and the availability of self-testing options.

5.6 Recommendation for further research

1. Exploration of perceived HIV risk and self-testing behavior; given the observed link between protection use and decreased HIVST uptake, a future study could delve deeper into students' risk perceptions regarding HIV. Specifically, a study could explore whether students who consistently practice safe sex perceive themselves as having a lower risk of HIV, and how this perception influences their motivation to engage in self-testing. This would be particularly valuable as understanding these perceptions can aid in developing tailored HIV testing and prevention interventions and educational campaigns.
2. Impact of stigma on HIVST utilization; the study findings challenge the traditional notion that stigma universally acts as a deterrent to HIV testing. Therefore, a qualitative study could be conducted to understand the nuanced relationship between stigma and HIVST among undergraduate students. This could include in-depth interviews or focus group discussions to gain insights into students' feelings of shame, fear of reactions, and their decision-making processes regarding HIVST.
3. Longitudinal study on HIVST patterns and academic progression; considering the significant variations in HIV self-testing utilization across different course types and year-of-study groups, a longitudinal study could be undertaken to track HIVST patterns of students as they progress through their academic journey.
4. Research on specific course dynamics; the significant variations in HIVST utilization across different courses, such as Nursing versus Dentistry, warrant further in-depth research. Understanding the specific dynamics, perceptions, and behaviors within each

course can provide insights into tailored interventions for improved HIVST uptake.

References

1. Abiodun, O. *et al.* (2014) 'Knowledge of HIV/AIDS and predictors of uptake of HIV counseling and testing among undergraduate students of a privately owned university in Nigeria', *BMC Research Notes*, 7(1), pp. 1–8. Available at: https://doi.org/10.1186/1756-0500-7-639.
2. Ahmadi, S.A.Y. *et al.* (2021) 'Designing a Logistic Regression Model for a Dataset to Predict Diabetic Foot Ulcer in Diabetic Patients: High-Density Lipoprotein (HDL) Cholesterol Was the Negative Predictor', *Journal of Diabetes Research*, 2021. Available at: https://doi.org/10.1155/2021/5521493.
3. Awopegba, O.E., Ologunowa, T.O. and Ajayi, A.I. (2021) 'HIV testing and self-testing coverage among men and women in South Africa: an exploration of related factors', *Tropical Medicine and International Health*, 26(2), pp. 214–227. Available at: https://doi.org/10.1111/tmi.13514.
4. Ayodele, O. (2017) 'The theory of planned behavior as a predictor of HIV testing intention', *American Journal of Health Behavior*, 41(2), pp. 147–151. Available at: https://doi.org/10.5993/AJHB.41.2.5.
5. Carin, A.A. & Sund, R.. (2018) *National AIDS and STI Control Programme (NASCOP), Preliminary KENPHIA 2018 Report. Nairobi: NASCOP; 2020.*
6. Choko, A.T. *et al.* (2017) 'Acceptability of woman-delivered HIV self-testing to the male partner, and additional interventions: a qualitative study of antenatal care participants in Malawi', *Journal of the International AIDS Society*, 20(1), p. 21610. Available at: https://doi.org/10.7448/IAS.20.1.21610.
7. Dzinamarira, T. *et al.* (2020) 'HIV self-testing in Rwanda: awareness and acceptability among male clinic attendees in Kigali, Rwanda: A cross-sectional survey', *Heliyon*, 6(3), p. e03515. Available at: https://doi.org/10.1016/j.heliyon.2020.e03515.
8. Eng, C.W. *et al.* (2021) 'Recent HIV testing and associated factors among people who use drugs in Cambodia: A national cross-sectional study', *BMJ Open*, 11(3), pp. 1–10. Available at: https://doi.org/10.1136/bmjopen-2020-045282.
9. Figueroa, C. *et al.* (2015) 'Attitudes and Acceptability on HIV Self-testing Among Key Populations: A Literature Review', *AIDS and Behavior*, 19(11), pp. 1949–1965. Available at: https://doi.org/10.1007/s10461-015-1097-8.
10. Guo, W. *et al.* (2015) 'Benefits and Potential Harms of HIV Self-Testing Among Men Who Have Sex With Men In China: An Implementation Perspective', *Cell Reports*,

11(10), pp. 1651–1666. Available at: https://doi.org/10.1097/OLQ.0000000000000581.Benefits.

11. He, J. *et al.* (2023) 'Uptake of HIV testing and its correlates among sexually experienced college students in Southwestern, China: a Web-Based online cross-sectional study', *BMC Public Health*, 23(1), pp. 1–12. Available at: https://doi.org/10.1186/s12889-023-16638-z.
12. Iliyasu, Z. *et al.* (2020) 'Acceptability and correlates of HIV self-testing among university students in northern Nigeria', *International Journal of STD and AIDS*, 31(9), pp. 820–831. Available at: https://doi.org/10.1177/0956462420920136.
13. Izizag, B.B. *et al.* (2018) 'Factors associated with acceptability of HIV self-testing (HIVST) among university students in a Peri-Urban area of the Democratic Republic of Congo (DRC)', *Pan African Medical Journal*, 31, pp. 1–9. Available at: https://doi.org/10.11604/pamj.2018.31.248.13855.
14. Jennings, L. *et al.* (2017) 'Perceived Cost Advantages and Disadvantages of Purchasing HIV Self-Testing Kits among Urban Tanzanian Men: An Inductive Content Analysis', *Annals of Global Health*, 83(1), p. 66. Available at: https://doi.org/10.1016/j.aogh.2017.03.145.
15. Johnson, C. *et al.* (2014) 'Realizing the potential for HIV self-testing', *AIDS and Behavior*, 18(SUPPL. 4), pp. 391–395. Available at: https://doi.org/10.1007/s10461-014-0832-x.
16. KENPHIA (2018) 'KENPHIA 2018-2020 PRELIMINARY REPORT', *Journal of Materials Processing Technology*, 1(1), pp. 1–8. Available at: http://dx.doi.org/10.1016/j.cirp.2016.06.001%0Ahttp://dx.doi.org/10.1016/j.powtec.2016.12.055%0Ahttps://doi.org/10.1016/j.ijfatigue.2019.02.006%0Ahttps://doi.org/10.1016/j.matlet.2019.04.024%0Ahttps://doi.org/10.1016/j.matlet.2019.127252%0Ahttp://dx.doi.o.
17. 'Kenya ARV Guidelines' (2022) *NASCOP* [Preprint], (KENYA ARV GUIDELINES).
18. Kulkarni, P. *et al.* (2013) 'Non-Adherence of New Pulmonary Tuberculosis Patients to Anti-Tuberculosis Treatment', *Annals of Medical and Health Sciences Research*, 3(1), p. 67. Available at: https://doi.org/10.4103/2141-9248.109507.
19. Liao, S. *et al.* (2023) 'Acceptance and associated factors of HIV testing among college students in China: A systematic review and meta-analysis', *PLoS ONE*, 18(4 April), pp. 1–14. Available at: https://doi.org/10.1371/journal.pone.0284865.

20. Makusha, T. *et al.* (2015) 'HIV self-testing could "revolutionize testing in South Africa, but it has got to be done properly": perceptions of key stakeholders.', *PloS one*, 10(3), p. e0122783. Available at: https://doi.org/10.1371/journal.pone.0122783.

21. McHugh, G. *et al.* (2023) 'On Campus HIV Self-Testing Distribution at Tertiary Level Colleges in Zimbabwe Increases Access to HIV Testing for Youth', *Journal of Adolescent Health*, 72(1), pp. 118–125. Available at: https://doi.org/10.1016/j.jadohealth.2022.09.004.

22. Morgantini, L.A. *et al.* (2020) 'Factors contributing to healthcare professional burnout during the COVID-19 pandemic: A rapid turnaround global survey', *PLoS ONE*, 15(9 September), pp. 1–11. Available at: https://doi.org/10.1371/journal.pone.0238217.

23. Mwangi, J. *et al.* (2022) 'Characteristics of users of HIV self-testing in Kenya, outcomes, and factors associated with use: results from a population-based HIV impact assessment, 2018', *BMC Public Health*, 22(1), pp. 1–10. Available at: https://doi.org/10.1186/s12889-022-12928-0.

24. Namande, M. *et al.* (2021) 'Prevalence and Factors Associated With Utilization of HIV Self Testing Among Students of Universities in South Western Uganda.', *Student's Journal of Health Research Africa*, 2(12), p. 9. Available at: https://sjhresearchafrica.org/index.php/public-html/article/view/67.

25. Nangendo, J. *et al.* (2020) 'Prevalence, associated factors and perspectives of HIV testing among men in Uganda', *PLoS ONE*, 15(8 August), pp. 1–20. Available at: https://doi.org/10.1371/journal.pone.0237402.

26. NASCOP (2019) 'An operational manual for the delivery of HIV Self-Testing services in Kenya', *Who*, p. 40. Available at: https://www.who.int/hiv/topics/self-testing/en/.

27. National AIDS Control Council (2018) 'Kenya HIV Estimates Report 2018', *Kenya HIV Estimates*, pp. 1–28. Available at: https://doi.org/10.1111/j.1365-2664.2007.0.

28. Ndabarora, E. and Mchunu, G. (2014a) 'Factors that influence utilisation of HIV/AIDS prevention methods among university students residing at a selected university campus', *Sahara J*, 11(1), pp. 202–210. Available at: https://doi.org/10.1080/17290376.2014.986517.

29. Ndabarora, E. and Mchunu, G. (2014b) 'Factors that influence utilisation of HIV/AIDS prevention methods among university students residing at a selected university campus', *Sahara J*, 11(1), pp. 202–210. Available at: https://doi.org/10.1080/17290376.2014.986517.

30. Njau, B. *et al.* (2019) 'A systematic review of qualitative evidence on factors enabling and deterring uptake of HIV self-testing in Africa', *BMC Public Health*, 19(1), pp. 1–16. Available at: https://doi.org/10.1186/s12889-019-7685-1.

31. Nkuna, E. and Nyazema, N.Z. (2016) 'HIV Self-Testing, Self-Stigma and Haart Treatment at the University of Limpopo: Health Sciences Students' Opinion and Perspectives', *The Open AIDS Journal*, 10(1), pp. 78–82. Available at: https://doi.org/10.2174/1874613601610010078.

32. Ntani, G. *et al.* (2021) 'Consequences of ignoring clustering in linear regression', *BMC Medical Research Methodology*, 21(1), pp. 1–13. Available at: https://doi.org/10.1186/s12874-021-01333-7.

33. Nyarondia, S., Ongong'a, J.O. and Omolo, K. (2014) 'Management in Action: Managing the HIV/AIDS Curriculum in Kenya', *Open Journal of Business and Management*, 02(03), pp. 204–209. Available at: https://doi.org/10.4236/ojbm.2014.23025.

34. Obiezu-Umeh, C. *et al.* (2021) 'Young people's preferences for HIV self-testing services in Nigeria: a qualitative analysis', *BMC Public Health*, 21(1), pp. 1–9. Available at: https://doi.org/10.1186/s12889-020-10072-1.

35. Okewo, E. (2021) 'Evaluation of Media Campaigns on Behaviour Change Among Kenyan Youth: an Analysis of'Chukua Selfie'Campaign.' Available at: http://erepository.uonbi.ac.ke/bitstream/handle/11295/161115/Okewo_Evaluation of Media Campaigns on Behaviour Change Among Kenyan Youth - an Analysis of 'Chukua Selfie' Campaign..pdf?sequence=1.

36. Oppong Asante, K. and Oti-Boadi, M. (2013) 'HIV/AIDS knowledge among undergraduate university students: Implications for health education programs in Ghana', *African Health Sciences*, 13(2), pp. 270–277. Available at: https://doi.org/10.4314/ahs.v13i2.11.

37. Paredes, A.J. *et al.* (2022) 'Systemic delivery of tenofovir alafenamide using dissolving and implantable microneedle patches', *Materials Today Bio*, 13(December 2021), p. 100217. Available at: https://doi.org/10.1016/j.mtbio.2022.100217.

38. Reddy, P. and Frantz, J. (2011) 'HIV / AIDS knowledge , behaviour and beliefs among South African university students Résumé Prevention and awareness programmes in place Study setting and sample size', 8(4), pp. 166–170.

39. Samuels, F. *et al.* (2020) 'Unintended Pregnancies and HIV among Adolescents and Young People: A Situation Analysis of Homa Bay, Kenya', pp. 1–75. Available at:

https://www.unicef.org/kenya/reports/unintended-pregnancies-and-hiv-among-adolescents-and-young-people-Homa-Bay.

40. Segawa, I. *et al.* (2022) 'Factors associated with HIV self-testing among female university students in Uganda: a cross-sectional study', *AIDS Research and Therapy*, 19(1), pp. 1–8. Available at: https://doi.org/10.1186/s12981-022-00484-x.
41. Shahzad, F. *et al.* (2021) 'Forward stepwise logistic regression approach for determinants of hepatitis B & C among Hiv/Aids patients', *Int. J. Nonlinear Anal. Appl*, 12(July 2021), pp. 2008–6822. Available at: http://dx.doi.org/10.22075/ijnaa.2022.5717.
42. Shipe, M.E. *et al.* (2019) 'Developing prediction models for clinical use using logistic regression: An overview', *Journal of Thoracic Disease*, 11(Suppl 4), pp. S574–S584. Available at: https://doi.org/10.21037/jtd.2019.01.25.
43. Teffo, M.E., Mndzebele, S.L. and Mokgatle, M.M. (2023) 'The acceptability and perceived use of HIV self-testing among technical vocational education and training students in Limpopo province', *Health SA Gesondheid*, 28, pp. 2017–2022. Available at: https://doi.org/10.4102/hsag.v28i0.2095.
44. Tonen-Wolyec, S. *et al.* (2019) 'Acceptability, feasibility, and individual preferences of blood-based HIV self-testing in a population-based sample of adolescents in Kisangani, Democratic Republic of the Congo', *PLoS ONE*, 14(7), pp. 1–16. Available at: https://doi.org/10.1371/journal.pone.0218795.
45. Tonen-Wolyec, S. *et al.* (2020) 'Sociodemographic characteristics of adolescents preferring home-based HIV self-testing over facility-based voluntary counseling and testing: a cross-sectional study in Kisangani, Democratic Republic of the Congo', *International Journal of STD and AIDS*, 31(5), pp. 481–487. Available at: https://doi.org/10.1177/0956462419898616.
46. UNAIDS (2013) 'A short technical update on self-testing for HIV', *Unaids*, pp. 1–13.
47. UNAIDS (2021) 'Young People and HIV', *Young people and HIV*, pp. 1–20. Available at: https://www.unaids.org/en/resources/documents/2021/young-people-and-hiv.
48. USAID and EPiC (2021) 'HIV self-testing operational guide for the planning, implementation, monitoring and reporting of HIV self-testing', (7200).
49. Vara, P.A. *et al.* (2020) 'Level of knowledge, acceptability, and willingness to use oral fluid HIV self-testing among medical students in Kilimanjaro region, Tanzania: A descriptive cross-sectional study', *AIDS Research and Therapy*, 17(1), pp. 1–10.

Available at: https://doi.org/10.1186/s12981-020-00311-1.

50. Wandera, S.O., Kwagala, B. and Maniragaba, F. (2020) 'Prevalence and determinants of recent HIV testing among older persons in rural Uganda: A cross-sectional study', *BMC Public Health*, 20(1), pp. 1–10. Available at: https://doi.org/10.1186/s12889-020-8193-z.

51. Woldeyohannes, D. *et al.* (2017) 'Risky HIV sexual behavior and utilization of voluntary counseling and HIV testing and associated factors among undergraduate students in Addis Ababa, Ethiopia', *BMC Public Health*, 17(1), pp. 1–10. Available at: https://doi.org/10.1186/s12889-017-4060-y.

52. Wong, V.J. *et al.* (2017) 'Adolescents , young people , and the 90 – 90 – 90 goals : a call to improve HIV testing and linkage to treatment', (May), pp. 191–194. Available at: https://doi.org/10.1097/QAD.0000000000001539.

53. Workie, D.L. *et al.* (2017) 'A binary logistic regression model with complex sampling design of unmet need for family planning among all women aged (15-49) in Ethiopia', *African Health Sciences*, 17(3), pp. 637–646. Available at: https://doi.org/10.4314/ahs.v17i3.6.

54. Wu, Q. *et al.* (2021) 'Logistic regression analysis of contrast-enhanced ultrasound and conventional ultrasound of follicular thyroid carcinoma and follicular adenoma', *Gland Surgery*, 10(10), pp. 2890–2900. Available at: https://doi.org/10.21037/gs-21-535.

Questionnaire

TITLE: DETERMINANTS OF HIV SELF-TESTING UTILIZATION AMONG HEALTH SCIENCES UNDERGRADUATE STUDENTS; A BINARY LOGISTIC REGRESSION APPROACH

Confidential contact information sheet

This form is for purposes of collecting a participant's contact information purely for purposes of contacting the participant in case of need for clarification of information given during the interview. Information here will only be used by the principal investigator. Information filled will not be included in the research data and will be treated with utmost confidentiality and kept safely under lock and key.

NAME_____

PHONE NUMBER _____

QUESTIONNAIRE SERIAL NUMBER _____

SOCIO-DEMOGRAPHIC DATA

1. Identification code of the participant…….
2. Age of your last birthday……
3. What is your gender?

   Male ☐ Female ☐ Other ☐……
4. What is your marital status?

   Single ☐ Married ☐ Divorced ☐

   Other ☐…….
5. What is your religion?

   Christian ☐ Muslim ☐ Hindu ☐

   Other ☐……

INSTITUITION FACTORS

1. What is your mode of study?

Full-time ☐ Part-time ☐

2. Which is your faculty …….
3. Which is your School / Department of study…….
4. Course……
5. What is your year of study?.....
6. What is your residency status?

   In-School ☐ Out of School ☐

SOCIO-ECONOMIC FACTORS

1. What is the source of funds for catering for your day-to-day expenses?

Formal-employment ☐ Self-employment ☐ Government-HELB ☐

Parents/Guardians/Caregivers Stipend ☐ Others ☐ …….

KNOWLEDGE ABOUT HIV

1.Do you think HIV/AIDS is a serious disease?

Yes ☐ No ☐ Unsure ☐

2.How is HIV spread? (Choose all that are applicable)

Sexually ☐Mother to Child ☐Blood Transfusion ☐Intravenous Drug Abuse ☐ Others ☐ (Specify)…….

3.How do you prevent acquiring HIV infection? (Choose all that are applicable)

Sexual abstinence ☐Being Faithful to one partner ☐Protected Sex ☐

Not sharing needles ☐ Handling any blood / contaminated products gloved ☐

Others ☐(Specify)…….

4.Are you aware of HIV Pre-exposure prophylaxis?

Yes ☐ No ☐

5.Does HIV have a cure?

Yes ☐ No ☐

6.If you get infected with HIV, can you live a normal life if on treatment with Highly active antiretroviral therapy [HAART]?

Yes ☐ No ☐

HIV TESTING ACCEPTANCE

1.Have you ever tested for HIV?

Yes ☐ No ☐

2.Have you ever used a HIV self-test kit?

Yes ☐ No ☐

3.If yes from (1) above, when did you do the test? Specify the year

4.What type of HIV test did you do?

Facility Test (VCT) ☐ HIV Self –Testing ☐

5.If you did HIV Self –Testing or answered 'Yes' to (2) above which self-test kit, did

you use? (Choose all that are applicable)

INSTI ☐ OraQuick ☐ Atomo HIV Self-Test ☐Don't know☐ Other ☐

6.How did you get to know about the HIV self-test kit? (Choose all that are applicable)

Print media ☐ social media ☐ Outdoor advertising ☐ Hearsay ☐

Referral from friend ☐Health education from a health worker ☐Internet ☐

TV/Radio ☐ Journal/article/manuscripts ☐

Others ☐…….

7.Do you prefer the blood or oral based HIV self-testing kit?

Blood ☐ Oral ☐ None ☐

8.Did you find the instructions in the test kit easy to understand?

Yes ☐ No ☐

9.Do you know the difference between Facility Testing (VCT) and HIV Self –Testing Services?

Yes ☐ No ☐

10.Where do you prefer getting tested for HIV from?

Health facility ☐ Privately at home ☐

11.Was it easy to access the HIV self-test kits?

Yes ☐ No ☐

12.Was the self-test kit affordable?

Yes ☐ No ☐

13.How much was the self-test kit? In Kenyan shillings

14.Do you feel confident testing and interpreting your HIV status at home?

Yes ☐ No ☐

15.Is privacy a major concern for you when doing an HIV test?

Yes ☐ No ☐

16.Why is it important to know HIV status? (Choose all that are applicable)

Testing saves lives ☐ Protecting loved ones ☐ Enables early treatment ☐ Stopping transmission to unborn baby ☐ Empowerment knowing HIV status ☐Staying alive and well ☐ Helps make informed choices about future ☐

Others ☐ (Specify)…….

17.What were your reasons for doing the HIV test? (Choose all that are

applicable)Routine Testing ☐ Specific risk incident ☐ Partner's request ☐

End/beginning of a relationship ☐Partner diagnosed as HIV positive ☐

Symptom of STD ☐ Part of ANC routine tests ☐Multiple sex partners ☐

Other ☐ (Specify)……

18.Have you ever tested the self-test kit with your sexual partner?

Yes ☐ No ☐

19.Did you share the results with your sexual partner(s)?

Yes ☐ No ☐

20.What would make you not perform a HIV test? (Choose all that are applicable)

Low perceived risk ☐Fearing a positive test result ☐Fear of partner's reaction ☐

Need for partner consent ☐Fear of stigmatization ☐Trusting your sexual partner

☐Recently tested (within past 6 months) ☐ Religious belief ☐Lack of

Confidence ☐Others ☐…….

21.What challenge(s) do you encounter when using Facility based HIV testing (VCT)? (Choose all applicable)

Fear of stigmatization ☐Religious belief ☐Mistrust of results ☐

Fear of being seen attending VCT clinic ☐Lack of privacy ☐

Too much time taken in counselling and testing ☐Inadequate counselling at VCT ☐

Difficulty accessing VCT (e.g. distance) ☐Others (Specify)…….

22.What challenge(s) do you encounter using HIV Self –Testing services? (Choose all applicable)

Difficulty accessing kit ☐Unaffordability of kit ☐

Difficulty understanding how to use kit ☐Difficulty interpreting results ☐

Difficult medical jargon in instruction material in kit☐

Difficulty accessing linkage to care & counselling after testing ☐

Others ☐ ……

23.After HIV self-testing did you seek a second opinion or counselling from a qualified health professional regarding your results?

Yes ☐ No ☐

24.After contacting a qualified healthcare professional did you access the following services: (Choose all that are applicable)

Linkage to HIV care☐ HIV Prevention education☐

Assisted partner notification services☐ Voluntary medical male circumcision☐

Pre/post exposure prophylaxis services☐

Others ☐.....

25.How much do you agree or disagree with this statement: “HIV self-test kits should be free in all public health facilities”.

Strongly agree☐ Agree☐ Neutral ☐ Disagree☐ Strongly Disagree ☐

SEXUAL BEHAVIOUR FACTORS

b. Have you ever had sex?Yes ☐ No ☐

c. Would you consider yourself sexually active?Yes ☐ No ☐

d. Do you always use protection when having sexual intercourse?Yes ☐ No ☐

e. Do you have multiple sexual partners?Yes ☐ No ☐

f. Have you ever had a sexually transmitted disease such as syphilis, herpes, gonorrhea?

Yes ☐ No ☐

g. What factors would you consider propagate risky sexual behaviors? (Choose all thatare applicable)

Early age of sexual debut ☐pre-marital sex ☐

HIV/AIDS transmission misinformation ☐” Sponsor” mentality☐

Unemployment ☐Lack of religious guidance ☐ Alcoholism & drug abuse

☐Stress & mental anguish ☐social media ☐ Online dating applications☐

Misinformation about contraceptives☐ Pornography ☐

Lack of parental guidance & mentorship ☐ Peer-pressure ☐

Other ☐……

STIGMA

h. Do you fear that you could contract HIV if you come into contact with the salivaof a person living with HIV?

Yes ☐ No ☐

i. Do you agree or disagree with the following statement: "I would be ashamed ifsomeone in my family had HIV"?

Strongly agree☐ Agree☐ Neutral ☐ Disagree☐ Strongly Disagree ☐

j. In your opinion, are people hesitant to take an HIV test due to fear of people's

/partners' reaction if the test result is positive for

HIV?Yes ☐ No ☐

k. Do people talk badly about people living with or thought to be living with HIV toothers?

Yes ☐ No ☐

l. Would you buy fresh meat from a butcher if you knew that this person had

HIV?Yes ☐ No ☐

m. Do you think a person living with HIV should be in a relationship or get marriedto a partner who is HIV negative?

Yes ☐ No ☐

n. Do you think a person living with HIV can safely get a child with a HIV negativeperson if he/she is on HIV care?

Yes ☐ No ☐

ACCESSIBILTY TO HEALTHCARE FACILITIES

o. Have you ever accessed HIV self-testing services in a health care

facility?Yes ☐ No ☐

p. If yes, where was it located?

Within campus☐ Out of campus☐

q. What kind of healthcare facility did you get your HIV self-testing kit from?(Choose all that are applicable)

University clinic/Hospital☐ Government

clinic/Hospital☐ Private clinic/Hospital☐ NGO clinic☐

Mobile clinic☐Stand-alone

testing center☐ Pharmacy/chemist☐

Other☐…….

r. Were you counselled before and after the

test?Yes ☐ No ☐

s. Were you charged for the testing service or the self-test kit?Yes ☐ No ☐

t. If yes was the cost reasonable or prohibitive?Reasonable ☐ Prohibitive☐

u. Do you prefer using HIV self-testing services to avoid going to healthcare facilities for HIV testing?

Yes ☐ No ☐

MEDIA EXPOSURE

v. Do you know about the campaign dubbed *"Chukua Selfie"*?Yes ☐ No ☐

w. If yes to (1) above, how did you hear about it? (Choose all that are applicable)Print media ☐ social media ☐ Outdoor advertising ☐ Hearsay ☐ From a friend ☐ From a health worker ☐Internet ☐ TV/Radio☐Others☐.....

x. Which tool of media do you prefer to use to gather and expand your knowledgeabout HIV self-testing? (Choose all that are applicable)

TV/Radio☐ Mobile Phone☐ Print media☐ Personal computer☐ Outdoor advertising☐ Other☐……

y. Which tool of media would you prefer to be used to spread information about HIVself-testing especially among the youth? (Choose all that are applicable)

TV/Radio☐ Mobile Phone☐ Print media☐ Personal computer☐

Outdoor advertising☐ Other☐……

z. If you have used the HIV self-testing kits, did you utilize the toll-free phone number or social media link given at the back of packages regardless of your test result?

Yes ☐ No ☐

aa. If yes, were you successfully linked to a health care provider or counselor?Yes ☐ No ☐

bb. Would you recommend the HIV self-testing to other people?Yes ☐ No ☐

Appendices
Consent Form

Participant Information Sheet (To be kept by participant)

Research Title: Determinants of HIV self-testing utilization among health sciences undergraduate students; A binary logistic regression approach

Dear Participant,

My name is Dr. Nicholas Kyalo Muendo. I am a master's student from University of Nairobi, Department of Public & Global Health currently pursuing an MSc in Medical Statistics. I am working with my department supervisors Dr. Peninah Masibo (Department of Public & Global Health - peninahmasibo@gmail.com) and Dr. George Muhua (Department of Mathematics - muhuageorge@gmail.com) University of Nairobi. I am conducting a research study titled, " Determinants of HIV Self testing utilization among health sciences undergraduate students; A binary logistic regression approach", which I invite you to take part in. This study aimsto study the determinants that facilitate or hinder the use of HIV self-testing kits. Upon you consenting to this, I will be required to ask you some questions about knowledge of HIV and HIV self-testing.

Voluntarism

Participation in this study is wholly voluntary. You have the right to decline participation or to withdraw your participation at any point you deem necessary. Your studies or academic program will not be interfered with should you agree to participate in this study. In case of any questions related to the study, you are at liberty to ask at any time.

Discomforts and Risks

If there are any questions that make you uncomfortable, you are at liberty to decline answering them. There are no risks involved as we shall not be testing or taking any samples from you. However, some questions might be slightly uncomfortable, you will be at liberty ofanswering them or not.

Benefits

There is no direct benefit to you if you participate in this study. However, the information you provide will help us develop and share policies in respect to HIV self-testing to increase uptake of self-testing kits among the youths for improved awareness among the untested population and to facilitate linkage to counselling and appropriate care.

Reward

There will be no rewards or payment offered if you agree to participate in this study.

Confidentiality

Your personal information will be handled with the utmost confidentiality and will be used for research purposes only. Your names will not be recorded on the questionnaires. Toprevent breach of confidentiality, you will be randomly assigned study identification numbers.The link between your name and the study identification numbers will be safely kept by the investigator and research team and may be used to enable communication in the case of any clarification needed.

Contact Information

If you have questions about the study, call the principal investigator Dr. Nicholas Kyalo Muendo 0721140370 and you can also contact him nikomuendo@yahoo.com. However, if you have questions about your rights as a study participant, you may contact KNH-UoN Ethics Review Committee Secretariat on uonknh_erc@uonbi.ac.ke

Participant's statement

I confirm that the above information regarding my participation in the study is clearly understood by me. That my participation in this study is voluntary and I can withdraw my participation at any time without penalty. That my information will be kept confidential. I agree to participate in this study.

Name: ……

Signature or Thumbprint: …….

Date: ……

Investigators Statement

I confirm that I have explained the information fully to the participant in a language he/she understands, the procedures to be followed in the study and the benefits and risks involved.

Name of Interviewer: ……

Signature ……..

Date ……

Ethics Approval

UNIVERSITY OF NAIROBI
FACULTY OF HEALTH SCIENCES
P O BOX 19676 Code 00202
TELEGRAMS: varsity
Tel:(254-020) 2726300 Ext 44355

KNH-UON ERC
Email: uonknh_erc@uonbi.ac.ke
Website: http://www.erc.uonbi.ac.ke
Facebook: https://www.facebook.com/uonknh.erc
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/428

10th August, 2023

KENYATTA NATIONAL HOSPITAL APPROVED 10 AUG 2023 KNH/UoN ERC P.O. Box 20723 - 00202 NAIROBI

Dr. Nicholas Kyalo Muendo
Reg.No.W62/34686/2019
Dept. of Public & Global Health
Faculty of Health Sciences
University of Nairobi

Dear Dr.Muendo,

ETHICAL APPROVAL-RESEARCH PROPOSAL: FACTORS AFFECTING HIV SELF-TESTING UTILIZATION AMONG HEALTH SCIENCES UNDERGRADUATE STUDENTS: A BINARY LOGISTIC REGRESSION APPROACH (P346/04/2023)

This is to inform you that KNH-UoN ERC has reviewed and approved your above research proposal. Your application approval number is **P346/04/2023.** The approval period is 10th August 2023 –9th August 2024.

This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consents, study instruments, MTA) will be used.
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by KNH-UoN ERC.
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to KNH-UoN ERC 72 hours of notification.
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH-UoN ERC within 72 hours.
v. Clearance for export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to KNH-UoN ERC.

UNIVERSITY OF NAIROBI
FACULTY OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
Tel:(254-020) 2726300 Ext 44355

KNH-UON ERC
Email: uonknh_erc@uonbi.ac.ke
Website: http://www.erc.uonbi.ac.ke
Facebook: https://www.facebook.com/uonknh.erc
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref.No.KNH/ERC/Mod&SAE/227

25th September, 2023

Dr. Nicholas Kyalo Muendo
Reg. No. W62/34686/2019
Dept. of Public and Global Health
Faculty of Health Sciences
University of Nairobi

Dear Dr. Muendo,

Re: Approval of Modifications - study titled, "Determinants of HIV Self-Testing Utilization among Health Sciences Undergraduate Students; A Binary Logistic Regression Approach" (P346/04/2023)

Your communication dated 9th August, 2023 refers.

The KNH- UoN ERC has reviewed and **approved** the following modifications made to the study:

1. Change of study title from "*Factors affecting HIV self-testing utilization among Health Sciences Undergraduate Students; A binary logistic regression approach*" to "***Determinants of HIV self-testing utilization among Health Sciences Undergraduate Students; A binary logistic regression approach***".
2. Replacement of the term '*factors*' with '***determinants***' throughout the research proposal; including in the study title, research question and objectives, study questionnaire, among other sections. It is noted that this change would broaden the scope of study to encompass a comprehensive assessment of both enabling factors and barriers to the utilization of HIV self-testing.

The requested modifications have been adequately justified and incorporated in the revised research proposal. No further risk to participants is anticipated with the changes.

With this approval, the following have been endorsed and study questionnaire and consent document stamped for use:

a. Revised Research Proposal.
b. Revised Participant Informed Consent Form.

Plagiarism Report

Determinants of HIV Self-Testing Utilization Among Health Sciences Undergraduate Students; A Binary Logistic Regression Approach

ORIGINALITY REPORT

8%	7%	4%	1%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www.ncbi.nlm.nih.gov Internet Source	2%
2	bmcpublichealth.biomedcentral.com Internet Source	<1%
3	www.unaids.org Internet Source	<1%
4	www.science.gov Internet Source	<1%
5	childrenandaids.org Internet Source	<1%
6	docksci.com Internet Source	<1%
7	en.wikipedia.org Internet Source	<1%
8	dspace.muhas.ac.tz:8080 Internet Source	<1%