DETERMINANTS OF CONTINUATION ON PRE-EXPOSURE PROPHYLAXIS:

A CASE OF NAIROBI COUNTY, KENYA

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X53/79220/2015

A FINAL RESEARCH SUBMITTED TO THE SCHOOL OF ECONOMICS IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE IN HEALTH ECONOMICS AND POLICY

UNIVERSITY OF NAIROBI

NOVEMBER 2019

DECLARATION/APPROVAL

I hereby declare that this research is my original work and that it has not been presented at any other university or institution.

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LIST OF ABBREVIATIONS

ARRM	AIDS Risk Reduction Model
CACC	Constituency AIDS Control Coordinators
CASCOs	County AIDS/STIs Control Officers
DD	Demand
DICE	Drop in Centre
ERB	Ethical Review Board
FSW	Female Sex Workers
GBV	Gender Based Violence
GoK	Government of Kenya
HBM	Health Belief Model
HIV	Human Immunodeficiency Virus
JDS	Jilinde Data System
KEMRI	Kenya Medical Research Institute
MARPS	Most at Risk Populations
MoH	Ministry of Health
MSM	Men who have Sex with Men
NACC	National AIDS Control Council
NASCOP	National AIDS & STIs Control Program
OPD	Outpatient Department
PEP	Post-Exposure Prophylaxis
PLWA	Persons Living with AIDS
PrEP	Pre-Exposure Prophylaxis
SDC	Sero-Discordant Couples
SDGs	Sustainable Development Goals

SMS	Short Message Services
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
UNAIDS	United Nations Programme on AIDS
VMMC	Voluntary Medical Male Circumcision
WHO	World Health Organization

DEDICATION

I dedicate this research work to my family, my wife Grace and sons: Ian, Brian and Ryan for their support and understanding during the entire period of my studies at the University of Nairobi, School of Economics.

ACKNOWLEDGEMENT

ABSTRACT

This study sought to investigate the determinants of continuation on pre-exposure prophylaxis; a case of Nairobi County in Kenya. More specifically, the study focused on two core objectives; firstly was examination of PrEP uptake rates and levels among female sex workers and men who have sex with men within Nairobi County and secondly; examination of factors that affect PrEP continuation among female sex workers and men who have sex with men in Nairobi County. The study adopted a quantitative research design which involved accessing secondary data from Jilinde Data System (JDS), a large program implementing PrEP in Kenya. Probit model was used in empirical data analysis. The study findings showed that 36.55 percent of individuals revisited health facilities for month one continuation in PrEP. The probit model results explain that revisit for PrEP is significantly determined by client's age, gender and entry point into PrEP. However, different HIV risk profiles were found to have different effects on revisit for PrEP. The study recommends adoption of a multi-sectoral approach in the implementation of PrEP as an intervention for HIV prevention.

CHAPTER ONE

INTRODUCTION

1.1 Background

Health is among the seventeen sustainable development goals (SDGs) whose promise is to end the epidemic of AIDs, tuberculosis, malaria among others by the year 2030 (UNAIDS, 2015). Globally, by year 2017, the number of people living with AIDS (PLWA) were estimated to be between 31.1 to 43.9 million with those newly infected (all ages) being approximately 1.4 to 2.4 million (UNAIDS, 2018). In order to reach the 2020 global target of reduction in numbers of people newly infected with HIV to less than 500,000, additional HIV prevention strategies especially among the key populations are needed. The World Health Organization (WHO) classifies key populations to consist both vulnerable and most at risk populations (MARPs). Vulnerable populations are those individuals at greatest risk of acquiring HIV by virtue of their situation and context, they include adolescents, orphans, street children, and persons in closed settings such as prisoners, migrants and mobile workers among others. While MARPs include men who have sex with men-MSM, transgender-TG, people who inject drugs-PWID and sex workers-SW and whom the world's health body recommends for specific strategies in reaching them(WHO, 2013).

The United Nations Program on AIDS (UNAIDS) data for sub-Saharan Africa, indicates a greatest reduction in number of new infections between year 2010 and 2017 with highest reduction (30%) contributed by East and Southern Africa. The total number of PLWA within Eastern and Southern Africa were estimated at 17.5 to 22.0 million, with those newly infected with HIV ranging between 650,000 to 1,000,000 (UNAIDS, 2018). In Kenya, data published by UNAIDS (2017), show that between 31,000 and 86,000 new HIV infections occurred across all ages in 2017 with women aged 15 and above accounting for the greatest number of these new infections at 27,000. Kenya's HIV prevalence trends indicate that national prevalence peaked at (10-11) % in mid-1990s before declining to 6.3% in 2006(GoK, 2014). This is a marked reduction from the year 1999 when HIV was declared a national disaster that paved way for both international and national level efforts towards combating the epidemic. Currently, the HIV prevalence has considerably declined from a high of 14% to 4.9% with those aged between 14-25

years of age (adolescents and youth) having the highest proportion in the rate of new infections as per Kenya's Demographic Health Population Survey(MoH, 2012). In spite of various HIV prevention approaches; Kenya's annual number of new infections has remained high; approximately 62,000 infections in 2017 translating to an incidence of 1.46% per 1000 population (UNAIDS, 2017).

This has seen Kenya include HIV prevention efforts in its national policy and strategic plans. The Kenya Health Policy 2014-2030 is part of a wider vision 2030 economic blue print which recognizes the role of health in achieving economic development. The health policy takes note of a decrease in HIV prevalence but identifies increased number of new HIV infections as a major health challenge in addition to tuberculosis (a communicable infection), injuries and non-communicable diseases, indeed, HIV remain the greatest contributor to causes of death (29.3%) and disability(24.2%) in Kenya (UNAIDS, 2018).

Following the 2010 enactment and implementation of a new constitution in Kenya , provision of health services were devolved to county level, while resource mobilization, priority setting and coordination of HIV/AIDS are vested at the National AIDS Control Council (NACC), a semi-autonomous government agency (SAGA) within Ministry of Health (MoH). Technical leadership rests with the National AIDS/STIs Control Program (NASCOP), a division within MoH while at county level, HIV stakeholders' coordination is now done by the constituency AIDS coordinating committees (CACCs) with delivery of HIV services being the responsibility of the County AIDS/STIs Control Officers (CASCOs).

The fight against HIV has been outlined in Kenya's National HIV Prevention Roadmap Plan 2014-2030 which is expected to guide efforts towards zero new infections by the year 2030 as HIV prevention is everyone's business(NACC, 2014). Among the major strategies identified by the roadmap towards ensuring reduction in new infections include moving from intervention driven to population driven, from those that were heavily bio-medical dependent to a combination prevention package consisting of biomedical, behavioral and structural interventions, from health sector-driven to an approach that makes HIV prevention everyone's business and from a national approach to geographical (county clusters) approach. The roadmap equally identifies 9 counties contributing to

over 65% of all new HIV infections and 10 counties namely Nairobi, Homa Bay, Siaya, Kisumu, Migori, Kisii, Nakuru, Kakamega, Mombasa and Kiambu are collectively home to an estimated 800,000 citizens living with HIV. Kenya has also committed itself to attainment of the UNAIDS 95-95-95 global targets.

In order to meet the prevention goal, a combination prevention package has been developed in the fight against HIV in line with Kenya's HIV Prevention Roadmap Plan goal of achieving a more than 75% reduction in the rate of new infections by the year 2020 and zero new infections by the year 2030 towards attaining Kenya's Vision 2030(NACC, 2014). The roadmap identified use of pre-exposure prophylaxis (PrEP) as an additional HIV prevention intervention strategy apart from use of condoms, voluntary medical male circumcision, and treatment as prevention among others. PrEP entails daily use of an antiretroviral medicine among persons considered to be at ongoing substantial risk of acquiring HIV infection. In order to address these ambitious prevention targets, Kenya's Ministry of Health through NASCOP has since adopted use of PrEP in its national guidelines on Use of Antiretroviral Drugs for Treating and Preventing HIV Infections(NASCOP, 2016).

The guidelines recommend a HIV test and risk assessment before one is begun on PrEP, facility revisits for a monthly PrEP refill dose and a HIV test every 90 days. With official launch of the National PrEP Implementation Framework in May 2017, PrEP rollout is now taking place across all counties in Kenya spearheaded by NASCOP and other stakeholders(MoH, 2017).

Data shared by NASCOP as of end June 2019 indicated that, approximately 56,000 clients had ever been initiated on PrEP countrywide with preliminary data from Jilinde (a large project implementing PrEP in Kenya) showing high PrEP uptake levels among men who have sex with men followed by female sex workers while lowest uptake was reported among adolescent girls and young women. The continuation rates or proportion of clients who go back for their first month facility revisits is quite low (42%) as reported by Jilinde Data System (JDS); June 2019. This implies that very few clients out of those initiated on PrEP go back for their PrEP refill doses. This falls short of the national PrEP guidelines recommendations(NASCOP, 2016). Low PrEP continuation rates predisposes

such individuals to risk of acquiring HIV due to ingestion of sub-optimal PrEP doses in case they engage in risky sexual acts. HIV-drug resistance may also occur at sub-therapeutic ARV drug doses in the presence of HIV infection and these may present programmatic challenges in achieving any meaningful impact in reduction of HIV incidence as well as elimination targets as prescribed by the 95-95-95 global targets and Kenya's Vision 2030.

1.2 Problem Statement

Pre-Exposure Prophylaxis (PrEP) is part of the HIV testing and anti-retroviral medicine-based strategies among other combination prevention programs towards attainment of UNAIDS target of 95 percent accessing tailored prevention services with three million individuals alone targeted for PrEP(UNAIDS, 2016). The targeted populations include female sex workers, men who have sex with men, young women and their sexual partners in high prevalence sites and persons who inject drugs. Kenya became one of the countries in Africa to officially and systematically rollout PrEP in May 2017(Masyuko et al, 2018). Current (2019) PrEP implementation data in Kenya showed that 42 percent of individuals returned for PrEP after initiation compared to 39.9 percent were still on PrEP among participants in two American states (Doblecki-Lewis et al., 2017). In a FEM-PrEP clinical trial, 28.5 percent of participants achieved a desirable measure for adherence determined by estimating drug concentration levels(Corneli et al., 2014).

Calculation of a month by month continuation rates on PrEP based on program aggregate data reveal a fluctuating continuation rates with a 12 month period ranging from as high as 76% to as low as 37% (Jilinde, 2019). Kenya's Framework for the Implementation of PrEP (NASCOP, 2017) recommends achievement of desirable continuation rates of 100 percent implying that all clients initiated on PrEP in any particular period should at least make a re-visit to a health facility within 30 days after initiation onto PrEP.

In a spatial study to assess PrEP outcomes among men who have sex with men at three months and six months in the USA, Chan et al, (2016) concluded that continuation of PrEP was suboptimal (72% at 3 months and 57% at 6 months), hence research gaps exist

in further understanding what factors (whether individual, social, or structural) may impede or enhance continuation on PrEP.

In Kenya, early findings from population level PrEP implementation show a high uptake (approximately 14,000 clients on PrEP) over a 12-month period of PrEP rollout(Masyuko et al, 2018). This therefore calls for efforts in further understanding what are the motivational factors and disincentives to PrEP continuation among clients initiated. Low month 1 PrEP continuation rates imply a short duration on PrEP with a less likely impact of oral PrEP as a HIV prevention intervention method of choice.

This study sought to examine predictors of PrEP continuation among female sex workers and men who have sex with men initiated on PrEP within Nairobi County in order to inform national PrEP implementation scale up as well as policy.

Nairobi County, though with a lower HIV prevalence (4.9%) compared to 5.6% national average is among the counties in Kenya with highest burden of HIV due to a large number of infected adolescents and adults aged 15-64 years (estimated 114,306) hence making it the best county to study PrEP interventions(MoH, 2012). The county is also home to a large number of key populations who are the main contributors to new HIV infections in Kenya(Okal et al., 2013).

1.3 Research Questions

i)   What is the PrEP uptake status among female sex workers and men who have sex with men seeking PrEP services in Nairobi County?

ii)   What factors affect PrEP continuation among female sex workers and men who have sex with men?

1.4 Research Objectives

The main objective was to identify PrEP uptake rates and factors affecting continuation on PrEP among female sex workers and men who have sex with men within Nairobi County. Specific objectives:

i)   To determine the PrEP uptake rates and levels among female sex workers and men who have sex with men in Nairobi County.

ii)   To assess the factors that affect PrEP continuation among female sex workers and men who have sex with men in Nairobi County

1.5 Study Justification

In the current global agenda for HIV prevention, care and treatment, PrEP is an important component towards achieving reduction in HIV incidence. Kenya has committed itself to reaching the global 95-95-95 targets towards the management and control of HIV and need to adopt use of PrEP as among the most recent, robust and cost effective HIV prevention interventions approaches that have been identified for continued efforts in the fight against the epidemic in order to minimize increasing new HIV infections especially among the adolescents and youth.

Early findings from PrEP implementation at scale reveal high PrEP uptake rates (many clients get enrolled into PrEP) but low continuation rates (few number of clients returning for their PrEP refill doses). This may result in failure to achieve the desired programmatic objectives in reducing HIV incidence due to high dropout rates among clients initiated on PrEP who may end up being exposed to HIV acquisition risk. This implies a less likelihood of PrEP impact towards HIV incidence reduction among female sex workers, men who have sex with men, adolescent girls and young women. Therefore, the national program requires further understanding on what is driving this challenge in order to come up with programmatic interventions to improve PrEP continuation rates.

While available studies have tried to explain possible contributing and inhibiting factors to PrEP continuation, the study findings were sub-optimal in explaining continuation on PrEP as the study scope centered on men who have sex with men in the USA with social insurance cover. Hence a research gap was identified involving PrEP implementation at scale and with scanty information on optimal PrEP implementation and in order to achieve desired programmatic objectives; this study sought to discern possible contributors to low PrEP continuation rates as well as factors which may affect continued

PrEP use. Understanding reasons for continued use will help inform design of innovative implementation strategies within Kenya as well as other countries of similar socio-economic settings.

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction
This chapter looked at existing economic and socio-behavioral theories which explain why individuals consume health services as well as take up various HIV prevention methods. In empirical literature, existing studies on possible determinants of continuation on PrEP were explored in detail. Finally, a summary of literature was done highlighting the strengths and potential gaps in existing studies and hence a justification for further research within the context of addressing challenges with continuation on PrEP.

2.1 Theoretical Literature

2.1.1 Theory of Consumer Behavior
Demand for health services is premised on individuals being rational consumers of normal goods whose goal is to maximize utility at minimal cost. In health, we consume healthcare services to produce health hence investment in health is one of the ways of contributing to human capital; a factor of production(Grossman, 2000). At macro level, a healthy population contributes to economic growth of a country hence the reason why nations invest in health infrastructure. In health economics, healthcare is termed as derived demand on the premise that we demand health but we consume healthcare to build adequate human capital stock which is known to gradually decrease with age. Some social-economic factors such as age, education levels, income, and health status may influence demand for health and consumption of healthcare.

2.1.2 The Health Belief Model
Individuals who decide to opt for PrEP as their method of choice for HIV prevention may be as a result of multiple factors. These include risk perception (the degree to which they feel to be at risk of acquiring HIV), accepting or rejecting the intervention may be attributed to the packaging style of PrEP messages used in demand and awareness creation approaches in reaching out to potential PrEP users or clients may also be persuaded by healthcare providers if the providers are convinced by available scientific evidence on PrEP's effectiveness. This is therefore in line with the Health Belief Model

(HBM) developed in 1950s which sought to explain why individuals fail to adopt preventive health measures(Taylor et al., 2007).

2.1.3 The AIDS Risk Reduction Model

AIDS risk reduction model (ARRM) is anchored on four theories; theory of planned behavior, social cognitive theory, the health belief model and diffusion of innovation model(Kuehn, 2006). These theories are closely associated and were fronted by psychologists to explain how behavioral attitudes and subjective norms influenced future behavior. The health belief theory is further composed of theory of reasoned action (TRA) and theory of planned behavior (TPB). These theories explain why even those individuals at perceived risk to HIV acquisition respond or fail to respond to available interventions. In addition, theory of planned behavior (TPB) added the dimension of perceived behavioral control(Schneider, Dandona, Pasupneti, Lakshmi, & Liao, 2010). In essence, TPB reinforces TRA to explain behavioral attitudes are not explained by attitudes but by behavioral intentions. This model has within its conceptual framework aided in the labelling and initial commitment to PrEP and adopting circumcision for HIV prevention.

2.2 Empirical Literature

2.2.1 HIV Prevention Methods

Behavioural, structural and bio-medical approaches have so far been employed in the fight against HIV. Behavioural method entails abstinence from sexual activity or having sex consistently with one partner of known HIV status. Structural HIV prevention measures include adopting and implementing appropriate policies through various institutions such as addressing the needs for orphans and vulnerable children, programs towards livelihood improvement and economic empowerment for women. While bio-medical interventions include use of barrier methods such as condoms and most recent (use of a single daily pill known as pre-exposure prophylaxis (PrEP) which requires HIV testing and screening for risk before initiation, once initiated onto PrEP, clients are then required to make re-visits to a health facility every 30 days for clinical follow up, monitoring and picking up their PrEP medicine refills.

2.2.2 PrEP Efficacy and Effectiveness

Global HIV prevention efforts have been targeted towards search for a HIV vaccine though none has so far resulted in any effective product at population level use. Clinical trials conducted in search for newer HIV prevention approaches have shown that a daily pill (Tenofovir/Emtricitabine) can be both efficacious and effective against HIV infection if good adherence levels are achieved(Tomaras et al., 2012). This led to PrEP adoption by the World Health Organization(WHO) as an additional HIV prevention intervention for persons at ongoing substantial risk of acquiring HIV(Haberer et al, 2012).

The WHO recommendations were informed by a number of clinical trials which found PrEP to be an efficacious if users achieve high adherence levels as collaborated from an open label randomized Pre-Exposure Prophylaxis to prevent acquisition of HIV-1 infection (PROUD) trial to demonstrate that PrEP works at real world settings(McCormack et al., 2016). Findings from this study supported use of a daily dose of Tenofovir-Emtricitabine at real-world settings in conferring protection among high HIV incidence population groups such as men who have sex with men with no evidence of increase in other sexually transmitted infections. McCormack et al (2016) additionally recommended for addressing of any structural and financial barriers which may impede PrEP implementation especially in resource limited settings.

In another study by (Folkers, 2012), achieving a HIV free generation by controlling and near elimination of HIV in the world would be possible if use of PrEP was adopted in addition to other HIV prevention strategies such as antiretroviral treatment as prevention, post exposure prophylaxis (PEP), voluntary medical male circumcision (VMMC), prevention of mother to child transmission and condom provision. This could eventually work towards societal benefits such as reduction in treatment costs and plummeting of HIV transmission rates (WHO, 2018).

Adoption of PrEP; is similar to VMMC as an evidence based HIV prevention intervention which contributed to the reduction of HIV incidence especially among black African males and equivalent to what a potential HIV vaccine or increased condom use can achieve(Reed et al, 2018).

2.2.3 Enhancers and Inhibitors of PrEP

PrEP, is a HIV prevention intervention which involves taking a daily pill which despite being a new technology and not widely available yet, has been shown to be acceptable among persons at great risk of acquiring HIV such as in men who have sex with men, as collaborated in a study to assess willingness to use PrEP among key populations in Myanmar, PrEP acceptability was 72 percent (Draper et al., 2017). In this multivariable logistic regression study, Draper et al (2017), demonstrated a number of factors associated with willingness to accept and use PrEP. These were; perceived risk to HIV infection, having more than one recent regular sex partner, no regular partner and more than five casual sex partners. Perception of risk among women has been found to be related to seasons of risk and this results in starting and stopping PrEP use. This was collaborated by findings from qualitative interviews among women at a higher risk of HIV in Kenya and South Africa(Namey et al., 2016). The women identified perceived risk, partnership dynamics (perceived low risk of a stable partner) and life events (such as holidays and travel) as reasons for taking breaks from PrEP use. These reasons may safely also be extrapolated to men who have sex with men.

Well before PrEP was available for use at scale, a number of studies were conducted to evaluate PrEP's acceptance, ones motivation and choice for HIV prevention for those with perceived risk of acquiring HIV infection. In one such studies, men who have sex with men and those aged below 35 years old were found to be more likely and willing to use PrEP if available as a single daily pill(Aghaizu et al, 2013). In this cross-sectional study carried out within a sexual health clinic in London sought to explore who would use PrEP and factors associated with potential PrEP users. Aghaizu et al (2013) thus concluded that MSM who were younger and highly exposed by having unprotected anal sex were likely to be PrEP users.

In order to create effective demand and uptake for PrEP, knowledge and awareness among targeted population is a key consideration. One such group are women of reproductive age who have been shown to have limited access to HIV prevention interventions contributed by factors such as lack of education, domestic chores workload, cultural norms which discourage discussions on sexuality and HIV as well as lack of

awareness and recommends use of a female peer educator so as to enhance access(Cummings et al, 2006).

Chan et al (2016), found that predictors of PrEP continuation in men who have sex with men differed across three distinct mid-sized US cities. In this study, continuation on PrEP was found to be suboptimal at 72 percent after 6 months and 52 percent after 3 months across the sites. Further, this multi-variate analysis study revealed that insurance status and medication costs were not significant barriers to obtaining PrEP but was inconclusive on what factors affect continuation and thus recommended further research in order to identify individual, social and structural factors that affect continuation on PrEP.

Continuous access to PrEP is important to guarantee its effectiveness. However, certain circumstances could hinder potential PrEP beneficiaries, in an attempt to investigate such barriers, a qualitative study involving female sex workers in Kisumu, Kenya, Bazzi et al (2019) identified substance use and violence as possible barriers to PrEP access and recommended use of an integrated programming approach in order to address the challenge.

PrEP works best and effectively in protecting persons at ongoing substantial HIV risk, however, high adherence levels to a daily dosing schedule are necessary as collaborated in a meta-analysis involving eighteen studies which concluded PrEP's effectiveness where uptake was greater than 70% and trials with low PrEP use showing no significant protectiveness(Fonner et al., 2016).

A rigorous systemic review and meta-analysis PrEP study done beyond clinical trials (PrEP use within real world settings), demonstrated good levels of adherence among young MSM in the USA(Hosek et al., 2018). In resource limited settings, with no facilities for monitoring serum PrEP drug concentration levels, adherence on PrEP may be monitored using unannounced home-based pill count method and still achieve the required PrEP effectiveness as revealed through a randomized placebo-controlled trial among sero-discordant couples in Kenya and Uganda(Haberer et al., 2013). Haberer et al (2013), showed that low adherence to PrEP was reported to be associated with sexual behavior, alcohol use, younger age and duration of PrEP use. This is a pointer to possible

predictors for continuation on PrEP which need to be addressed in order to ensure successful implementation of this intervention.

The desired PrEP effects or its impact on HIV incidence reduction has mainly been through mathematical modelling and is thought to achieve similar cost effectiveness comparable to male circumcision(Kacker et al, 2013).

Just like any medication, use of PrEP may have undesirable effects on PrEP users which may interfere with daily adherence and uptake. Results from initial clinical trials, demonstration projects and implementation at population level have shown that PrEP negative effects may occur among a minority of users, though these effects tend to wear off. This is collaborated with results from an open label-extension study, Draper et al (2017), where gastro intestinal tract (GIT) symptoms were cited as the most common side effects observed but which resolve after a period of 3-months. In a study to assess appropriate transition from PEP to PrEP, it was found out that adverse events arising from the drug(Tenofovir/Emtricitabine) such as osteopenia (weakening of bones) may result in PrEP discontinuation even though a client may wish to take PrEP(Jain et al, 2015).

It is anticipated that clients who accept and initiate on PrEP are less likely to use condoms while engaging in sex. This is due to perceived protection and knowledge that PrEP confers one some protection from acquiring HIV just as effective as condom use(Holt et al, 2014).

Racial and genetics may be a contributory factor to PrEP uptake as a result of patterns of risk observed by Fields et al, (2019). These were; being black male by race, having multiple sexual partners or engaging in condomless sex were high risk factors associated with likelihood of PrEP uptake.

The settings under which PrEP services are offered are thought to be a determinant for not only PrEP uptake but also for making a re-visit for PrEP. This is as a result of perceptions of providers towards those who seek PrEP services who are mainly perceived to be engaged in transactional sex. This provider attitude as well as the general public

towards potential PrEP users may result in stigmatization of PrEP users and failure of PrEP as an intervention in achieving the desired goals of HIV prevention(Jaspal et al, 2019). In this vignette study, Jaspal et al (2019), concluded that there is need for increased public awareness on what PrEP is so as its intended goal can be achieved.

2.3 Overview of the Literature

Studies conducted so far have identified factors contributing to continuation on HIV prevention interventions, in one such studies, Chan et al (2016), concluded that continuity on PrEP can vary across nations, geography and race. In another qualitative study, Bazzi et al (2019), identified stigma and violence as factors more likely to affect PrEP uptake and continuation. Uptake of health services has been shown to be influenced by age, income and education levels; (Mwabu, 1986) demonstrated that these same factors may be extrapolated to affect uptake of a HIV prevention intervention such as PrEP.

Results from available studies identify socioeconomic and individual attributes as possible factors affecting health seeking behavior for preventive services. These factors vary across population groups and geographical boundaries, ideally, success of a health intervention requires that services provided are fully consumed by the target population (uptake). Uptake of these services may be dependent on perception on quality, physical access (in terms of geographical distance and cost of transportation), affordability of healthcare costs, level of education, opportunity costs among others.

Returning for PrEP refills after initiation (1st revisit) is a pointer to the extent to which clients on PrEP perceive themselves to be at risk and hence the need to reduce one's chances of acquiring an infection by remaining on PrEP. This is collaborated in a study to assess commitment to PrEP and circumcision in HIV prevention among truck drivers in India(Schneider et al., 2010). The study recommended use of an AIDS risk reduction model (ARRM) in identifying leverage points that may be used by peers and health providers in order to enhance commitment to a new HIV prevention interventions.

CHAPTER THREE
METHODOLOGY

3.0 Introduction

In this chapter, the approaches used to meet the objectives of this study are explained; they include theoretical framework and econometric models.

3.1 Theoretical Framework

Conceptual Framework

Figure 3.1 below illustrates the relationship between independent variables and the dependent variables as adapted from the AIDS risk reduction (ARRM) model.

Independent Variables Variable

Dependent/Outcome

| Socio-demographic; age, sex, |
| Quality of service-initial counselling, SMS reminders |
| Behavior; risk profile pattern |
| Health systems; entry point into PrEP, facility type |

1st Revisit on PrEP
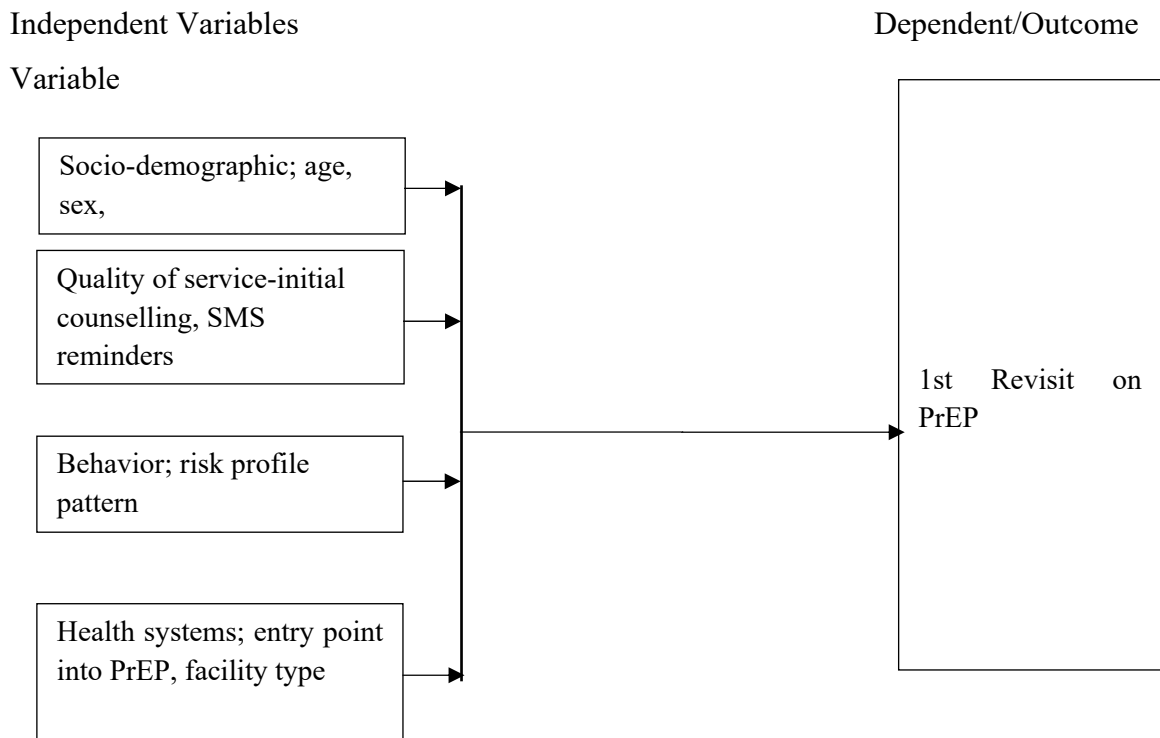
Source: Author's (2019).

The above conceptual framework borrows from the AIDS risk reduction model (ARRM) which encompasses a three stage process; the first being risk assessment, then factors that influence the decision to reduce risk and lastly the ability to change as well as maintain behavior. The independent variables include characteristics of person who will be still on PrEP or otherwise and include; demographics (age, gender, marital status), population type (men who have sex with men {MSM}, female sex workers {FSW}) while health system setup include entry point into PrEP and facility type. Continuation on PrEP (dependent variable) will serve as a proxy measure for reduction in lifetime HIV risk as the health outcome. Above parameters will be treated as independent variables against 1st revisit on PrEP as a dependent variable and analyzed using a simple logical regression model to establish the effects of each of the factors on PrEP continuation.

In the derivation of the conceptual framework and the empirical model, the study borrowed partially from Mwabu (1984) and Maletela *et al.* (2003) with modifications supported by the theory of consumer – demand theory. An attempt was made to provide a theoretical explanation for certain empirical observations about an individual seeking healthcare services, in this case, revisiting a health facility for oral PrEP services. The model assumed that individuals are faced information asymmetry regarding oral PrEP services. In the study, the demand of a representative consumer who in this case was a female sex worker or a men who have sex with men was expressed as:

$$DD = f(X) + \varepsilon \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(1)$$

Where: DD is the consumer's demand for healthcare service. X is a vector of characteristics of consumer who intend to consume healthcare services and other possible control factors.

3.2 Econometric Model Specification

In developing an econometric model, the assumption made is that an individual derives a utility from accessing and returning for PrEP services. Further, beyond uptake of PrEP, a FSW and MSM derives additional utility from a condom-less sexual activity which is made safer by PrEP consumption. Returning for a revisit for further access to PrEP doses and any additional package of health services can be said to be influenced by age, sex, education levels, individual risk patterns, whether an individual receives a short message service (SMS) reminders, quality and organization of PrEP services.

Theory of consumer behavior explains this phenomenon as the outcome variable of interest (in this case; returning for a 1st PrEP revisit) is being maximized and hence utilization of health services can be modelled on a consumption function. This is in line with consumer behavior that postulates that households will allocate among different goods and services to maximize utility on a given fixed income.

The study model was based on Mwabu (1984) and Maletela et al. (2003) model of demand for healthcare.

We assume that the individual maximizes utility from the consumption of healthcare. The general utility function is given as;

$$U = f(H,C) \quad \text{...} (2)$$

Where; U= utility, H= healthcare and C is consumption of other market goods. The individual therefore maximizes utility subject to budget constraint and health production function, dependent on market inputs such as healthcare services (HIV prevention services), other health determinants such as socio-demographic characteristics, quality of services among others. The budget constraint can be expressed as;

$$I = P_H H + P_C C \quad \text{...} (3)$$

Therefore to maximize utility from consumption of PrEP services, a probit model was adopted empirical estimation. The model lies within the range of (0, 1) to examine the variables. The main concern will be to interpret the dependent variable as a probability of returning for PrEP services given the explanatory variables. It is assumed that there is a linear relationship between the latent variable y* and explanatory variables Xi. The general structural model is presented in equation 4 as follows:

$$y^* = X_i\beta + \varepsilon \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(4)$$

Where y* is the unobserved latent variable ranging from negative to positive infinity ($-\infty$ to $+\infty$) whilst Xi represents a vector of explanatory variables; age of the client; the client's gender; population types mainly classified as female sex workers and men who have sex with men; facility type classified into Drop in Centre (DICE), public and private health facility; entry point into PrEP defined as inter-facility referrals, peer referrals, outreaches and self-referrals; whether receives SMS reminders for revisits due date and whether adherence counselling was done for clients being started on PrEP. In addition was the risk profile that was defined by 8 risk factors namely; (1) having a sex partner who is or are HIV positive; (2) having a sex partner(s) who are high risk and of unknown HIV status; (3) having recurrent sex under influence of alcohol/recreational drugs; (4) recurrent use of post exposure prophylaxis; (5) experiencing ongoing intimate partner violence-IPV(gender based violence-GBV); (6) engaging in transactional sex; (7) injecting drug use with shared needles and or syringes and (8) inconsistent or no condom use. The latent variable y* and the observed variable are then linked using equation 5 as follows:

$$y = \begin{cases} 0 \text{ if } y^* < K \\ 1 \text{ if } y^* \geq K \end{cases} \dots\dots \dots\dots \dots\dots \dots\dots \dots\dots \dots\dots \dots (5),$$

Where y* is the probability of client's revisit for PrEP continuation (1 if revisit, 0 otherwise). K is the threshold point/ cut off, critical level of the index y∗ beyond which the individual revisits for PrEP continuation. The average characteristic of variables Xi

are then regressed against y to determine the influence of each variable on client's revisit for PrEP continuation.

The probability of reporting that the client's revisited the facility for PrEP continuation can be expressed as follows assuming the error term has a standard probit distribution;

$$P_i = E(Y = 1/X_i) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x_i + \varepsilon_i)}} \quad \text{...(6)}$$

Where, P_i is the likelihood of revisiting measured as, 1 if revisit, 0 otherwise.

Xi represents the factors affecting the probability of client's revisit, β_0 and β_1 are parameters and ε_i is the error term.

$P_i = E(Y = 1/X_i)$ Implies the probability that Y takes a value 1 given the value of X. This can further be simplified as;

$$P_1 = E(Y = 1/X_i) = \frac{1}{1 + e^{-zi}} \quad \text{...(7)}$$

Where

$$Z_i = \beta_0 + \beta_1 X_i + \varepsilon_i \quad \text{...(8)}$$

zi = β0 + β1Xi + εi

The actual probit regression model for client's revisit for PrEP continuation is given by the equation;

$$Revisit_{ij} = \beta_0 + \beta_1 Age_i + \beta_2 Gender_i + \beta_3 Poptypef_i + \beta_4 Ftype_i + \beta_5 FET_i + \beta_6 Risk\,Profile_i + \beta_7 Rem_i$$
$$+ \beta_8 QoS_i + \varepsilon_t \quad \text{...(9)}$$

Where:

Revisit　　　is the client revisit for PrEP continuation

Age　　　is the client's age

Gender　　　is the sex of the client

Poptypef　　　is the population type, FSW or MSM

Ftype　　　is the facility type,

FET	is the entry point into PrEP		
Risk Profile	is the risk profile		
Rem	is the SMS reminder		
QoS	is the quality of service		
Ɛ	is the error term of the model		

3.3 Definition of Variables, Measurement and Expected Signs

The dependent variable for this study is the probability of client's revisiting for PrEP continuation. The independent variables in the study were clients' characteristics such as age, sex, population type, facility type, entry point into PrEP and risk profile. The measurement and definition of the variables in the probit model for this study were guided by the rationale presented in table 3.1 as follows:

Table 3.1: Definition of Variables and their Expected signs

Variable Name	Variable Definition	Measurement	Expected Sign
Dependent Variable			
PrEP continuation	Clients continuing on PrEP	1 if Return at 1st revisit, 0 otherwise	
Independent Variables			
Age group 1	(age ≤17 yrs)	1 if Age is ≤17 yrs 0 otherwise)	Positive
Age group 2	(age ≥ 18 ≤ 25 yrs)	1 if Age is ≥18yrs ≤25 yrs 0 otherwise)	Positive
Age group 3	(age ≥26 ≤35 yrs)	1 if Age is ≥26yrs ≤35 yrs 0 otherwise)	Positive
Age group 4	(age > 35 yrs)	1 if Age is > 35 yrs 0 otherwise)	Positive
Sex	This is either male, female	1 if Female, 0 otherwise.	Positive
Population Type	MSM and FSW	1 if FSW, 0 otherwise	Positive
Facility Type	Drop in Centre(DICE), Public and Private Health	1if Drop in Centre-DICE,	Positive

		Facility	0 otherwise	
Entry Point into PrEP	Inter-facility referrals, peer referrals, outreaches and self-referrals	1 if Peer referral, 0 otherwise	Negative
Risk 1:	Sex partner is or are HIV positive	1 if yes, 0 otherwise	Positive
Risk 2:	Sex partner(s) high risk and HIV status is unknown	1 if yes, 0 otherwise	Positive
Risk 3:	Recurrent sex under influence of alcohol/recreational drugs	1 if yes, 0 otherwise	Positive
Risk 4:	Recurrent use of post exposure prophylaxis (PEP)	1 if yes, 0 otherwise	Negative
Risk 5:	Ongoing intimate partner violence-IPV(gender based violence-GBV)	1 if yes, 0 otherwise	Positive
Risk 6:	Engaging in transactional sex	1 if yes, 0 otherwise	Positive
Risk 7:	Injecting drug use with shared needles and or syringes	1 if yes, 0 otherwise	Positive
Risk 8:	Risk 8 - inconsistent or no condom use	1 if yes, 0 otherwise	Negative
Receiving Short Message Services (SMS) Reminders	Whether receives SMS reminders for PrEP revisits due date	1 if received SMS reminder, 0 otherwise	Positive
Quality of Service	Whether adherence counselling is done or not, used as a proxy measure for quality	1 if adherence counselling done 0 otherwise	Positive

3.4 Data Source and Analysis

The analysis involved secondary data sources obtained from consolidated client level data collected from nationally developed forms known as client encounter and follow up forms for clients enrolled and initiated in PrEP. A client encounter and follow up form is a primary data capture tool normally completed for all persons initiated into PrEP. These data was obtained from Jilinde Project and was consolidated through an electronic data capture system known as Jilinde Data System (JDS). JDS contains data from routine PrEP service delivery within health facilities using Kenya's Ministry of Health standardized forms. Entry of these data was done using a tablet at project sites and relayed in an encrypted format to a central server managed by Jilinde Project. The analyzed data was devoid of any client identifier information so as to assure confidentiality and that only authorised persons accessed these password protected data. Stata version 14 was used to analyze the data.

3.5 Ethical Considerations:

Ethical approval was sought from Kenya Medical Research Institute-KEMRI Ethical Review Board (ERB). The references for the initially obtained approval and deviation approval are *KEMRI/RES/7/3/1* dated 1st March 2018 and *KEMRI/RES/7/3/1* dated 9th February 2019 respectively.

CHAPTER FOUR

RESULTS AND INTERPRETATIONS

4.0 Introduction

This chapter presents descriptive statistics and probit model results after analysis of determinants of continuation on pre-exposure prophylaxis; a case of Nairobi County, Kenya.

4.1 Descriptive Summary Statistics

Table **4.1.1** below gives a summary for each of the variable in terms of number of total observations, mean, standard deviation, minimum, maximum value and quantifies missing observations for each variable.

Table 4.1.1 Descriptive Summary Statistics

Variable	Measurement	Obs	Mean	Std. Dev.	Min	Max	Missing
Revisiting for PrEP	1if return at 1st revisit, 0 otherwise	8,594	0.3655	0.4816	0	1	0
Sex	1 if Female, 0 otherwise.	8,585	0.8116	0.3910	0	1	9
Age group 1 (age ≤17 yrs)	1 if Age is ≤17 yrs 0 otherwise)	8,594	0.6452	0.4785	0	1	0
Age group 2 (age ≥ 18 ≤ 25 yrs)	1 if Age is ≥18yrs ≤25 yrs 0 otherwise)	8,594	0.2478	0.4318	0	1	0
Age group 3 (age ≥26 ≤35 yrs)	1 if Age is ≥26yrs ≤35 yrs 0 otherwise)	8,594	0.0841	0.2776	0	1	0
Age group 4 (age > 35 yrs)	1 if Age is > 35 yrs 0 otherwise)	8,594	0.0228	0.1493	0	1	0
Population Type	1 if FSW, 0 otherwise	8,594	0.8117	0.3910	0	1	0
Entry point into PrEP	1 if by Peer referral, 0 otherwise	8,594	0.5387	0.4985	0	1	0
Risk1 - Sex partner is or are HIV positive	1 if yes, 0 otherwise	8,594	0.0085	0.0918	0	1	0
Risk2 - Sex partner(s) high risk	1 if yes, 0 otherwise	8,554	0.8253	0.3797	0	1	40

and HIV status is unknown							
Risk3 - Recurrent sex under influence of alcohol/recreational drugs	1 if yes, 0 otherwise	8,554	0.3210	0.4669	0	1	40
Risk4 - Recurrent use of post exposure prophylaxis (PEP)	1 if yes, 0 otherwise	8,554	0.0484	0.2146	0	1	40
Risk5 - Ongoing intimate partner violence-IPV(gender based violence-GBV)	1 if yes, 0 otherwise	8,554	0.0212	0.1439	0	1	40
Risk6 - Engaging in transactional sex,	1 if yes, 0 otherwise	8,554	0.5679	0.4954	0	1	40
Risk7 - Injecting drug use with shared needles and or syringes	1 if yes, 0 otherwise	8,554	0.0023	0.0483	0	1	40
Risk8 - Inconsistent or no condom use	1 if yes, 0 otherwise	8,554	0.5997	0.4900	0	1	40
SMS Reminder	1 if yes, 0 otherwise	8,585	0.4097	0.4918	0	1	9
Adherence counselling	1 if yes, 0 otherwise	8,014	0.9970	0.0546	0	1	580
Facility type	1 if DICE 0 otherwise	8,594	0.8871	0.3165	0	1	0

The descriptive statistics indicate that the total population under study from Nairobi County captured in the survey was 8,594 individuals. In terms of revisiting for PrEP, 36.55 percent of the individuals had made a 1st revisit to a health facility for PrEP implying that a majority; 63.45 percent did not revisit the facilities in the time period captured by the survey. Out of the target population captured by the survey, female were the majority at 81.16 percent. With regard to age group, 64.52 percent of the individuals were 17 years and below, 24.78 percent were between 18 years and 25 years, 8.41 percent were between 26 years and 35 years with 2.28 percent being above 35 years. Population type reveals that 81.17 percent were female sex workers-FSW while 18.83 percent represented men who have sex with men-MSM. The facility type show that majority of individuals accessed PrEP within Drop in Centres (DICE) at 88.71 percent

with a negligible number of individuals coming from private and public facilities. An investigation of the entry points into PrEP results indicate that approximately half of the population (53.87 percent) of the individuals entered into PrEP through a peer referral mechanism. Regarding risk profiles, having sex with a partner(s) who is (were) at high risk and whose HIV status was unknown topped the risk profile prevalence at 82.53 percent while having a sex partner(s) who was or were HIV positive or was an injecting drug user and shared needles and or syringes least prevailed with prevalence below 1 percent (0.85 and 0.23 percent respectively). Prevalence of engagement in transactional sex and inconsistent or no condom use were found to be substantially high at 56.79 and 59.97 percent respectively. On use of information technology; results reveal that 40.97 percent of revisits for PrEP received a short messaging service (SMS) reminder. Analysis of the proxy measure for quality of services with regard to PrEP Programme indicate that almost all individuals (99.70 percent) had adherence counselling done prior to initiating on PrEP.

In examining presence of any correlation between individuals' revisits for PrEP and the independent variables of the model, chi2 analysis was used to give deeper insights into how independent variables individually relate with revisits for PrEP. The results are summarized in **table 4.1.2** below.

The chi2 analysis for revisits and sex indicates that there exists a significant difference in PrEP revisits between female and male. As such, the results indicate that the decision whether to revisit or not to revisit significantly changes with the gender of the individual. This is evidenced by the fact that the probability of the chi2 between revisits and gender is less than 0.05 (5 percent) significance level. In general, PrEP revisits are seen to significantly change with population type, individual's age group, entry point into PrEP, having a sex partner who is or are HIV positive, having a sex partner(s) who are high risk and whose HIV status is unknown, engaging in transactional sex, inconsistent or no condom use, receiving a SMS reminder and facility type since the probability of their respective chi2 are less than 0.05 (5 percent) significance level as per (**table 4.1.2**) below.

Table 4.1.2 Tabulation of PrEP revisits against other variables

Independent Variables	Revisit	
	Pearson chi2(1)	Probability
Sex	8.9331	**0.003**
Agegroup1 (age ≤17 yrs)	22.1955	**0.000**
Agegroup2 (age ≥ 18 ≤ 25 yrs)	1.1324	0.287
Agegroup3 (age ≥ 26 ≤ 35 yrs)	26.4673	**0.000**
Age group 4 (age > 35 yrs)	6.0291	**0.014**
Population Type	8.7557	**0.003**
Entry point into PrEP	43.1625	**0.000**
Risk1 - Sex partner is or are HIV positive	4.1234	**0.042**
Risk2 - Sex partner(s) high risk and HIV status is unknown	19.6987	**0.000**
Risk3 - Recurrent sex under influence of alcohol/recreational drugs	0.5223	0.470
Risk4 - Recurrent use of post exposure prophylaxis (PEP)	0.9199	0.337
Risk5 - Ongoing intimate partner violence-IPV(gender based violence-GBV)	0.4658	0.495
Risk6 - Engaging in transactional sex,	4.6420	**0.031**
Risk7 - Injecting drug use with shared needles and or syringes	0.5985	0.439
Risk8 - Inconsistent or no condom use	32.5970	**0.000**
SMS Reminder	65.7162	**0.000**
Adherence Counselling	0.2545	0.614
Facility Type	10.4971	**0.005**

In order to test for presence of multi-collinearity within the independent variables, the correlation matrix results (**see appendix 1**), indicate that there are no two variables that are strongly correlated with each other. This is because none have a correlation coefficient equal or greater than 0.70. This therefore rules out possibility of multicollinearity in the regression analysis.

4.2 Probit Model Results and Interpretation

Prior to the estimation of the probit model, all the individuals with a missing variable observations were dropped. This was to ensure that the data set used for estimating the probit model was complete. Further, the benchmark categories for the dummy variables were determined and set accordingly. For the age group dummy, the age group beyond 35 years was set as the benchmark category. For gender, being male was set as the benchmark category. For population type, MSM was set as the benchmark category. For facility type, public and private facilities were set as the benchmark category. For the entry point into PrEP, inter-facility referrals, outreaches and self-referrals were set as the benchmark category. With regard to receipt of SMS reminder, not receiving a SMS reminder was set as the benchmark category. On adherence counselling, lack of adherence counselling was set as the benchmark category. With regard to each of the risk profiles, absence of risk was set as the benchmark category. Upon setting the respective dummy categories, the outcome of the probit model is presented in **table 4.2.1** as follows:

Table 4.2.1 Estimates of revisit for PrEP Probit Model Results

Revisit1	Coefficient	Std. Err.	z	p>z	[95% Conf. Interval]	
Agegroup1 (age ≤17 yrs)	-0.2041	0.1011	-2.02	0.044**	-0.40227	-0.00587
Agegroup2 (age ≥ 18 ≤ 25 yrs)	0.1702	0.1030	1.65	0.019**	-0.37215	-0.031742
Agegroup3 (age ≥ 26 ≤ 35 yrs)	0.0232	0.1103	0.21	0.034**	-0.193	0.239353
Female	0.2372	0.1594	1.49	0.017**	0.054959	0.075121
Female Sex Worker	0.1218	0.1596	0.76	0.446	-0.19111	0.434694
Drop in Centre	0.2573	0.0546	4.71	0.000***	0.150311	0.364288
Peer Referral	-0.3328	0.0363	-9.17	0.000***	-0.40396	-0.26164
Risk1 - Sex partner is or are HIV positive	0.1985	0.1676	1.18	0.236	-0.13009	0.527007
Risk2 - Sex partner(s) high risk and HIV status is unknown	0.1179	0.0390	3.03	0.002**	-0.19434	-0.04153
Risk3 - Recurrent sex under influence of alcohol/recreational drugs	0.0978	0.0359	2.72	0.006**	0.027433	0.168134
Risk4 - Recurrent use of post exposure prophylaxis (PEP)	0.0699	0.0706	0.99	0.322	-0.06849	0.208323
Risk5 - Ongoing intimate partner violence-IPV(gender based violence-GBV)	-0.0304	0.1046	-0.29	0.771	-0.23549	0.174658
Risk6 - Engaging in transactional sex,	-0.1080	0.0344	-3.14	0.002**	-0.17534	-0.04062
Risk7 - Injecting drug use with shared needles and or syringes	0.3618	0.2850	1.27	0.204	-0.19673	0.920335
Risk8 - Inconsistent or no condom use	0.0461	0.0367	1.26	0.209	-0.02587	0.118041
SMS Reminder	0.2329	0.0310	7.5	0.000***	0.172079	0.293769
Adherence	0.2246	0.2683	0.84	0.403	-0.075056	0.30132
Constant	0.0919	0.2955	0.31	0.756	-0.48733	0.67117

*Source: Author's computation (2019). **p value<0.05, ***p value<0.001*

From the findings of the study, the probit model results indicate that persons aged below 18 years were less likely to revisit for PrEP continuation compared to persons beyond 35 years. However, persons within 18 – 25 years bracket and persons within 26 – 35 years bracket are more likely to revisit for PrEP compared to persons beyond 35 years. In regards to gender, results indicate that female clients were more likely to revisit for PrEP compared male clients.

Regarding facility type, clients accessing PrEP within Drop in Centres (DICEs) are more likely to revisit for PrEP compared to clients within public and private health facilities. With regard to entry point into PrEP, clients initiated on PrEP through peer referrals are less likely to revisit for PrEP compared to clients through inter-facility referrals, outreaches and self-referrals. Clients receiving a SMS reminder were more likely to revisit for PrEP compared to those that did not.

Risk profiles significantly associated with likelihood of PrEP revisit include those clients with those with a sex partner who is or are HIV positive, a high risk partner(s) and whose HIV status is unknown, having recurrent sex under influence of alcohol or recreational drugs while those engaging in transactional sex were significantly associated with less likely chance of PrEP revisit compared to those that do not.

4.3 Marginal Effects for Respective Independent Variables

The marginal effects enable us to tell the magnitude of effect of an independent variable on dependent variable under probit model with sanctity. In order to determine the magnitude of effect for respective independent variables on returning for a PrEP re-visit, marginal effects for the respective independent variables were computed as shown in **table 4.3.1** below.

Table 4.3.1 Marginal Effects for Predictor Variables

Revisit1	Marginal Effects (dydx)	Std. Err.	z	P>z	[95% Conf. Interval]	
Agegroup1 (age ≤17 yrs)	-0.0751	0.0372	-2.0200	**0.044***	-0.1480	-0.0022
Agegroup2 (age ≥ 18 ≤ 25 yrs)	0.0626	0.0379	1.6500	**0.019***	-0.1369	-0.0116
Agegroup3 (age ≥ 26 ≤ 35 yrs)	0.0085	0.0406	0.2100	**0.034***	-0.0710	-0.0881
Female	0.0873	0.0586	1.4900	**0.017***	-0.2022	-0.0276
Female Sex Worker	0.0448	0.0587	0.7600	0.446	-0.0703	0.1599
Drop in Centre	0.0947	0.0200	4.7300	**0.000****	0.0555	0.1339
Peer Referral	-0.1225	0.0132	-9.3100	**0.000****	-0.1482	-0.0967
Risk1 - Sex partner is or are HIV positive	0.0730	0.0617	1.1800	0.236	-0.0478	0.1939
Risk2 - Sex partner(s) high risk and HIV status is unknown	0.0434	0.0143	3.0300	**0.002***	-0.0715	-0.0153
Risk3 - Recurrent sex under influence of alcohol/recreational drugs	0.0360	0.0132	2.7300	**0.006***	0.0101	0.0618
Risk4 - Recurrent use of post exposure prophylaxis (PEP)	0.0257	0.0260	0.9900	0.322	-0.0252	0.0766
Risk5 - Ongoing intimate partner violence-IPV(gender based violence-GBV)	-0.0112	0.0385	-0.2900	0.771	-0.0866	0.0643
Risk6 - Engaging in transactional sex,	-0.0397	0.0126	-3.1500	**0.002***	-0.0645	-0.0150
Risk7 - Injecting drug use with shared needles and or syringes	0.1331	0.1048	1.2700	0.204	-0.0723	0.3386
Risk8 - Inconsistent or no condom use	0.0170	0.0135	1.2600	0.209	-0.0095	0.0434
SMS service reminder	0.0857	0.0113	7.5800	**0.000****	0.0635	0.1079
Adherence	0.0826	0.0987	0.8400	0.403	-0.2761	0.1108

*Source: Author's computation (2019). *p value<0.05, **p value<0.001*

From the marginal effects results, variables found to be significant (whether more or less likely) for a PrEP revisit were; age, gender, facility type, entry point into PrEP, type of HIV risk profile one is predisposed to such as whether having a sex partner(s) who is high risk and whose HIV status is unknown, having recurrent sex under influence of alcohol or recreational drugs, engaging in transactional sex and receiving a SMS reminder.

These results provide us with sufficient evidence to conclude that persons who are aged below 18 years were less likely to revisit for PrEP continuation compared to persons aged older than 35 years by 7.51 percent. This implies that persons within the youth age bracket being more sexually active youth are more likely to seek PrEP services given that there is greater utility derived from engaging in condomless sexual acts. Possibly; those acts are compensated higher amounts compared to transactional sexual acts with clients involving condom use. Notably, this age group may derive their livelihoods from daily sexual encounters hence there is greater motivation towards returning for additional PrEP doses which serve to minimize exposure to HIV infection among those with perceived risk. These results are similar to findings from Aghaizu et al (2013) who concluded that younger MSM were more likely to be PrEP users.

In regards to gender, results indicate that females were more likely to revisit for PrEP compared to male clients by 8.73 percent. This is not only exemplified with high PrEP uptake among the FSW but can also be attributed to the higher propensity of females than males in health seeking behavior. In a qualitative study conducted by Namey et al (2016) within Kenya and South Africa suggests that female remain or drop off from PrEP due to perception of risk as a result of changing seasons of risk.

Clients who get enroll into PrEP within Drop in Centres (DICEs) as their facility type of choice, were found to more likely revisit for PrEP compared to clients enrolled within public and private facility types by 9.47 percent. DICEs are programmatically and physically designed to offer a safe space such as a conducive and tranquil environment to majority of FSW compared to public health facilities. This is collaborated by Jaspal et al (2019) study findings which emphasized on the importance of positive attitudes towards those who are intended to benefit from an intervention such as PrEP. The study postulates

that if beneficiaries of a certain service are not socially accepted, the likelihood of them seeking those services is decreased.

Entry point into PrEP refers to the mechanism on which clients acquire knowledge, become aware and eventually result to demand for PrEP services. In this study, the findings suggest that those clients who were referred for PrEP services through peers were less likely to revisit for PrEP compared to inter-facility referrals, outreaches and self-referrals by 12.25 percent. This implies that PrEP programs that lay greater emphasis on and compensation to peers proportional to the number of clients linked to PrEP may be unsustainable in enhancing revisits in the longer term. However, this is contrary to findings from a qualitative study conducted in Ethiopia by Cummings et al (2006) which called for strengthening of a female led peer education system in enhancing access to HIV prevention services for women.

Clients initiating into PrEP undergo an assessment against a list of pre-determined patterns of risk to acquiring HIV infection. Analysis results show that risk profiles among clients whose partners are high risk and of unknown HIV status are more likely to revisit for PrEP compared to clients with a sex partner(s) who is low risk and whose HIV status is known by 4.34 percent. This is collaborated by findings from Aghaizu et al (2013) who concluded that MSM who were highly exposed by having unprotected anal sex were likely to be PrEP users.

Clients who engage in recurrent sex under influence of alcohol or recreational drugs are more likely to revisit for PrEP compared to clients with no recurrent sex under influence of alcohol/recreational drugs by 3.60 percent.

Results from this study significantly suggest that clients engaging in transactional sex were less likely to return for a PrEP revisit compared to those that do not engage in transactional sex by 3.97 percent. However, this contradicts findings by Draper et al. (2017) who concluded that factors associated with willingness, acceptance and use of PrEP include perceived risk to HIV infection, having more than one recent regular sex partner, having no regular partner and having more than five casual partners.

Receiving a SMS reminder compared to those who don't increased likelihood of returning for a PrEP by 8.57 percent. This signifies the important role played by utilizing information technology innovations in rolling out HIV prevention interventions such as PrEP.

CHAPTER FIVE
SUMMARY AND CONCLUSIONS

5.0 Summary

This study has examined individual characteristics, risk profiles and other determinants more or less likely to contribute to revisiting for PrEP among newly initiated female sex workers and men who have sex with men on pre-exposure prophylaxis as their method of choice for HIV prevention. The study utilized secondary clinical data routinely collected at each client visit within PrEP delivery sites in Nairobi City County, Republic of Kenya.

The findings have shown that age, gender, facility type, entry point into PrEP were significant determinants towards a PrEP revisit. In terms of risk profile; having sex with a high risk partner(s) and whose HIV status is unknown; having recurrent sex under influence of alcohol or recreational drugs and engaging in transactional sex were risk profiles more likely to influence a PrEP revisit.

Further, findings from this study show that though recurrent use of post exposure prophylaxis (PEP) confers one eligibility into for PrEP, this risk profile was not significant in determining returning for PrEP. This could be explained by presence of a greater motivation to utilize PEP after exposure to risk than prior use of PrEP in anticipation of risk. Therefore, this may imply that such clients are more exposed to an intermittent rather than a continuous ongoing risk to HIV acquisition, hence programs may consider that not all recurrent PEP users will automatically consider PrEP as their immediate alternative HIV prevention method.

Findings on intimate partner violence or gender based violence being less likely to influence return for PrEP, though found not significant, were in agreement with findings by Bazzi et al.(2019) who studied female sex workers in Kisumu, Kenya and concluded that violence was a possible barrier to PrEP access. This can be explained by possible social stigma experienced by GBV victims which makes them less confident in seeking services for their own health. Also, most transactional sex involving adolescent girls and young women (AGYW) constitutes an asymmetrical relationships where the AGYW

have less bargaining; therefore, this target population require integrated programming in order to fully address their vulnerability issues.

Regarding frequency and consistence in condom use, the study findings, though not significant imply that clients who engage in sex with inconsistent or no condom use are more likely to revisit for PrEP. This is a good pointer to the role that PrEP plays as an additional HIV prevention method of choice among these most at risk populations. This is consistent with findings from Holt et al (2014) in a cross-sectional study among MSM in Australia where those likely to use PrEP expressed less likelihood to simultaneous condom use. Also, as PrEP rollout extends to cover injecting drug users, it is promising from these findings that those who frequently share needles and or syringes are more likely to revisit for PrEP.

5.1 Conclusion and Policy Implications

To a large extent, these study findings are in line with the current PrEP implementation experiences in Kenya and other countries. Though some findings contradict a popular belief that PrEP would be an appropriate HIV prevention method of choice among the key populations others are in agreement with experiences from PrEP clinical trials and demonstration studies in terms of reasons for taking up and remaining on this intervention as the preferred choice for HIV prevention.

A high PrEP uptake and likelihood of return for PrEP among females as opposed to men imply an important contribution played by gender in the fight against HIV. This calls for more investments in programs targeting female sex workers as part of the key and vulnerable populations. This include; reducing gender in-equalities, women empowerment and livelihood improvement.

A peer referral mechanism plays a key role in the initial mobilization and enrollment of clients into PrEP, however, findings from this study suggest that peer referral is not significant in determining likelihood for a PrEP revisit. This therefore presents an opportunity for re-evaluating the role of a peer system in PrEP programs especially in terms of how incentives are packaged. Indeed, in the course of PrEP implementation in real life settings, experience has shown that whenever peers receive incentives of

whatever kind when referring clients for PrEP, withdrawal of such incentives results in decreased PrEP enrollments. This calls for stakeholders to consider redefining the roles played by the peers in PrEP initiation and continuation for the sake of addressing not only program sustainability but also towards PrEP impact in averting new HIV infections.

Also, contrary to expectations that clients' perceived and real risk to HIV infection significantly plays a role in PrEP continuation, findings from this study show that certain risk profile patterns such as ongoing intimate partner violence and engaging in transactional sex were less likely to revisit for PrEP. This can be explained by the fact that such clients may opt for other substitute HIV prevention options such as condom use. This may be explained by concerns such as pill burden resulting from the need for clients to take PrEP on a daily basis for its effectiveness.

The findings do not seem to imply presence of any significant relationship between returning for PrEP and being a FSW or a MSM but rather being female than male was significant. This therefore suggests that whether persons self-identify themselves as FSW or MSM when seeking PrEP services will not have an effect on returning for a re-visit. This is contrary to popular believe that a FSW or MSM is likely to face stigma and discrimination from among health workers whenever they seek a health service.

Positive findings on effects of SMS reminder services in returning for PrEP is an indicator of the role of information and mobile phone technology in the implementation and delivery of HIV prevention services.

5.2 Limitations of the Study

This study utilized routine client level secondary data collected using a prescribed set of national PrEP data tools. However, these tools (client encounter and follow up form), developed by Kenya's National HIV program-NASCOP lacked a specific indicator that capture clients' level of education; hence this variable could not be modelled into the probit model as part of the possible predictors for a PrEP revisit. Also, being a cross-sectional study design rather than longitudinal, generated measures of associations than causal relationships.

In addition, there isn't a direct, quantitative measure for quality of PrEP services and since no qualitative assessment such as exit interviews or focus group discussions were conducted to complement this study; provider adherence counselling was arrived at as a proxy measure for quality of PrEP services offered. In addition, PrEP being a nascent HIV prevention intervention has limited published research findings for referencing especially implementation experiences at real life settings.

5.3 Suggestions for Areas of Further Research

Predictors for a revisit on PrEP have been analyzed using quantitative data obtained from routine clinic data. As mentioned earlier within my study limitation, these quantitative findings have not been triangulated with results from complementary qualitative studies such as focused group discussions or exit interviews. This calls for further analysis in understanding motivators on remaining on PrEP from the clients' perspective.

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Appendix 1 Correlation Matrix

	Revisit1	Female	FSW	Dice	Private	Peer	Risk1	Risk2	Risk3	Risk4	Risk5	Risk6	Risk7	Risk8	Reminder	Adherence
Revisit1	1															
Female	-0.036	1														
FSW	-0.0329	0.9739	1													
Dice	0.035	-0.0472	-0.0418	1												
Private	0.0061	0.0109	0.0109	-0.0665	1											
Peer	-0.0742	-0.2439	-0.2437	0.3342	-0.0247	1										
Risk1	0.0174	-0.0216	-0.0142	-0.0981	-0.0019	-0.0439	1									
Risk2	-0.049	-0.0523	-0.0589	0.0001	0.0102	0.0452	-0.1177	1								
Risk3	-0.0095	0.1586	0.1571	-0.0026	0.0205	0.2117	-0.0305	0.1128	1							
Risk4	0.0145	0.0757	0.0711	0.0284	-0.0049	-0.0347	0.0164	-0.0319	0.095	1						
Risk5	-0.0037	0.0246	0.0223	-0.0497	-0.0033	-0.0301	0.0186	0.0172	0.0328	0.1983	1					
Risk6	-0.0185	0.409	0.4119	-0.0496	0.0081	0.358	-0.0213	0.041	-0.1251	0.0394	0.0427	1				
Risk7	0.013	0.0099	0.0099	-0.019	-0.0011	-0.01	-0.0041	-0.0065	0.0124	0.0148	0.0671	-0.0069	1			
Risk8	0.0638	-0.1869	-0.1815	0.1792	-0.0045	-0.2229	0.0218	-0.1687	-0.4699	-0.0323	-0.0098	0.1256	0.0065	1		
Reminder	0.0891	-0.2404	-0.2442	0.1804	-0.0079	0.2209	-0.0079	0.0895	-0.032	-0.0416	-0.0365	-0.1309	-0.0088	0.1211	1	
Adherence	-0.0056	-0.021	-0.021	0.0194	0.0012	-0.0084	0.0047	-0.0128	-0.0062	-0.0098	-0.0081	0.0125	0.0026	0.0204	0.0056	1