FACTORS INFLUENCING VIROLOGICAL SUPPRESSION AMONG HIV INFECTED SEX WORKERS AND GENERAL POPULATIONS INHOMA BAY COUNTY, KENYA

BY

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DECLARATION

The research thesis'Factors influencing virological suppression among HIV infected sex workers and general population in Homa Bay County, Kenya'is my own work and has never been presented for the award of Master degree in Maseno University or in any other universityto any other institution for any award. No part of this work should be published without the prior knowledge or consent of the author or that of Maseno University

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DEDICATION

To my loving husband, Jack Hesbon Magara. To my late parents Mrs. Jane Akoth Adagi and Martin Migot Adagi; God rest their soul in peace.

ABSTRACT

By 2019, 36.9 million people were living with the HIV globally with about 67.8% on antiretroviral therapy (ART). In Kenya, 54% of 1.6 million people living with HIV (PLHIV) know their status, 73% of whom are on ART and of these 68% are virally suppressed. Homa Bay County has a HIV prevalence of 20.7% with 79% PLHIV taking ART out of whom 79% are virally suppressed. Viral suppression is critical to curbing HIV transmission and preventing drug resistance. Among key populations, viral suppression varies widely from 20% among men who have sex with men (MSM) to 70% among female sex workers (FSW). Recent reports from Homa Bay County indicate viral suppression rate of 80% in the general population (GP) compared to 98% for FSW and 99% for MSM. However, factors that mediate differences in viral suppression between the general and key populations are unknown. The current study investigated factors underlying its occurrence, particularly in integrated public health facilities providing differentiated HIV care. Specifically, the study determined the association between risky behavior, socio-demographic and clinical characteristics and viral load. Through a cross-sectional design, qualitative and quantitative data was collected from a targeted population of 663(376 GP and 287 KP) HIV infected FSW and GP enrolled for ART services in three integrated health facilities providing differentiated HIV care. Participant mean age was 38.4 years (SD= 6.9) and 35.4 years (SD 7.6) for KP and GP respectively. Viral suppression among KPs was 94.5% (n=271) versus GPs, 89.4% (n=338) (p=0.027). Anti-retroviral regime (KP 95.5%, X^2 = 42.365; P<0.0001; GP 89.9%, X^2 = 11.1667; P=0.025) and ART adherence (KP X^2 = 106.4599; P<0.0001; GP X^2 = 33.8846; P<0.0001) were significantly associated with VL suppression in both populations. In contrast, TB/Pneumonia (X^2 = 8.6742; P=0.003), duration on ART (X^2 = 33.400; P<0.004) and regime switch (X^2 = 26.2631; P<0.001) incidence predicted poor viral load suppression among KP with disproportionately higher ORs for poor adherence (OR 65.5332, 95% CI 7.850-547.079, p< 0.0001). Particularly, use of alcohol and substance abuse (X^2 =20.6090; p<0.0001) and gender-based violence, (X^2 = 4.7586; p=0.029) were associated with poor VL suppression among GP. Overally, a high prevalence of STI of 34.8% was observed. Results indicate that viral suppression is a function of personal, interpersonal and systems factors. KPs are comparatively more vulnerable to poorer VL controls. Differentiated care is therefore recommended so as to improved population differences in the health outcomes among PLHIV.

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LIST OF ABBREVIATIONS

AIDS	:	Acquire Immune Deficiency Syndrome
ART	:	Antiretroviral therapy
DiCE	:	Drop in Center
DTG	:	Dultegravine
EFV	:	Efavirenzes
FGD	:	Focus Group Discussion
FSW	:	Female sex workers
HIV	:	Human Immune Virus
KAIS	:	Kenya Indicator AIDS Survey
KENPHIA	:	Kenya Population Based HIV Impact Assessment
KDHS	:	Kenya Demographics Health Survey
KPs	:	Key Populations
LDL	:	Low detectable level of HIV virus
LVL	:	Low viremia level
MOH	:	Ministry of Health
MSM	:	Men who have sex with men
NACOSTI	:	National Commission of Science and Technology Institute
NASCOP	:	National AIDS and Sexually Transmitted Infections Coordination Program
NNRTI	:	Non-Nucleosides Reserve Transcriptase
PI	:	Protein Inhibitors
PLHIV	:	People living with HIV
PWID	:	People who Inject Drugs
RAs	:	Research Assistant
SEM	:	Social Ecological Model
STI	:	Sexually transmitted infection
SPSS	:	Statistical package for social scientists
TB	:	Tuberculosis
UNAIDS	:	United Nations Program on HIV and AIDS
U=U	:	Undetectable is equal Untransmissible HIV
VL	:	Viral load
WHO	:	World Health Organization

DEFINITION OF KEY TERMS

Adherence: The extent to which the behavior of a person under treatment corresponds with medical advice. Here it is used to denote the ability to take medication as prescribed.

Antiretroviral therapy: Drugs designed to suppress the progression of HIV/AIDS consisting of double or triple combination therapy.

Integrated facilities: These are sites where populations at increased risk of HIV acquisition get comprehensive HIV prevention services within the mainstream government health facilities.

Key populations: Are populations that due to specific higher risk behaviors are at increased risk of HIV irrespective of the epidemic type or local context. Also, they often have legal and social barriers that increase their vulnerability. The Kenya AIDS Strategic Framework 2014/15- 18/19 focuses on three sub-populations: female sex workers, men who have sex with men and people who inject drugs. In this study, key populations are female sex works and MSM.

Key population typology: This refers to categorization of KPs according to various criteria including practice, mode of operation, mode of organization, nature of the sex work network, place of sex, primary place of solicitation, earnings, and level of autonomy from brothel owners.

Multiple sexual partners: Engaging in sexual activity with multiple partners.

Men who have sex with men: Describes males who engage in sexual and/or romantic relations with other males.

Opportunistic infections: Infections in an immuno-compromised individual caused by pathogens that usually do not cause disease in a healthy immune system

People who inject drugs: Refers to people who inject psychotropic (or psychoactive) substances for nonmedical purposes. These drugs include but are not limited to opioids, amphetamine – type stimulants, cocaine, hypno-sedatives and hallucinogens. Injections may be through intravenous, intramuscular, subcutaneous, or other injectable routes

Risk-taking behavior: Risk-taking refers to the tendency to engage in behavior that have the potential to be harmful or dangerous, yet at the same time provide the opportunity for some kind of outcome that can be perceived as positive.

Sex workers: In this study, these are persons who receive money or goods in exchange for sexual services, either regularly or occasionally.

Viremia: Presence of HIV in the bloodstream

Virological suppression: Reduction in the function and replication of HIV virus in the bloodstream which is often also termed as viral load suppression. The cut-off for suppression as used in this study is <200 copies.

Virological failure: Occurs when ART fails to suppress and sustain a person's viral load to less than 50 copies. Virological failure is due to drug resistance, drug toxicity, poor adherence and opportunistic infections.

Viral load: Viral load refers to the concentration of free viruses detectable in blood. The viral load is expressed as copies/mL or log10. A patient's viral load should be less than detectable copies (depending on the test used) after four to six months on antiretroviral therapy. This is an indication of treatment effectiveness (ART guideline 2018).

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CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

The global burden of HIV remains high with 38 million people living with HIV (PLHIV), with east and southern Africa alone accounting for 20.6 million of them and 670,000 new HIV infections in 2020 (UNAIDS, 2021). By 2021, approximately 84% of all the PLHIV globally knew their status of which 73% were on life saving treatment and about 66% of them achieving suppressed viral loads (UNAIDS, 2021). Based on the sustainable development goals to eliminate HIV as a public health threat by 2030, progression towards achieving the global targets of getting 90% of all PLHIV knowing their status, 90% of them being put on treatment and of these 90% attaining viral suppression (defined as having less than 200 copies of HIV per milliliter of blood) by 2020 were missed globally. This was mainly attributed to the difficulties in reaching the key populations with effective interventions, yet even where implementations occur, intervention gaps and improvement actions are still largely undefined. Even though the global annual number of new HIV infections has been reducing progressively, notably due to increased HIV testing and access to antiretroviral therapy (ART), there is still more that needs to be done to close the tides in achieving the UNAIDS goal of epidemic control.

Key populations, comprising men who have sex with men, sex workers, transgender people, people who inject drugs and clients of sex workers and partners of other key populations were the main drivers of HIV, contributing about 65% of new infections by 2020 (UNAIDS, 2021). In addition, implementation of strategic HIV intervention approaches have had mixed uptake and outcomes across regions, the differences among them being notable between general and key population (Jin et al., 2021; Viswasam et al., 2020) The strategic HIV control approaches, to be implemented as a combination comprise of early HIV diagnosis; prompt linkage and retention in HIV treatment and care to ensure rapid, effective and sustained viral suppression; prevention among the at-risk groups using proven interventions and; identifying HIV clusters and responding to stop new infections (UNAIDS, 2014a).

Notably, while the sub-Sahara Africa has had remarkable decline in new HIV infections and related mortality, this declining trend has either slowed, plateaued or in some cases new cases are rising among certain key population clusters (UNAIDS, 2021). Conversely, interventions with key populations pose unique challenges due to stigma and legal barriers, which might

explain the consistently increasing trend of new HIV infections and apparent growing gaps in HIV control and health outcomes equated to the general population (Hakim et al., 2018).

In Kenya, a report by NASCOP, (2020b) indicated that of adults aged 15 – 64 years, 79.5% of those who tested HIV positive during Kenya Population-based HIV Impact Assessment (KENPHIA) 2018 knew their HIV status. Overall, 76.3% of all adults living with HIV are on ART with 90.6% having achieved viral load suppression. The key populations, comprising FSW, MSM and PWID in Kenya contribute 33% of new HIV infections (Cherutich et al., 2016). However, because HIV epidemic and intervention dynamics among KP as well as the general population are both socially and geographically heterogeneous, the health outcomes might similarly vary across contexts (Musyoki et al., 2018). A report by Musyoki et al., (2018) in Kenya indicated an increased risk for HIV of up to 10 times for FSW and 24 times for either of MSM and PWID compared to the general populations and that stigma, social exclusion and inequitable access to care remain high. On the other hand, KPs living with HIV have reported better adherence to anti-retroviral therapy than those in the general population. This phenomenon is still poorly understood. Understanding these variations and factors associated with virological suppression (the ultimate control clinical outcome expected) is necessary to inform intervention decisions regarding the planning and implementation of these intervention strategies more effectively.

Homa Bay County which leads nationally with highest HIV incidence of 8.2% (4558) per annum and an overall prevalence of 20.7% among the adult population of 15-49 years (De Cock et al., 2014) also lags behind in achieving the national targets for HIV epidemic control. The proportion of those on ART stands at 79% out of the total 138,921 adults living with HIV. Of those taking ART in the county, the prevalence of viral load suppression is at 79% (NASCOP, 2020). The county has approximately 3,838 sex workers. Of these, 29.3% and 18.2% are HIV positive FSW and MSM respectively. Of these 95% are taking ART and 98% have sustained viral load suppression and stable on ART (Musyoki et al., 2018).

While it is evident that multiple factors acting at different levels exert influence on the HIV testing, treatment and care cascade, heterogeneous epidemiology of HIV across demographic, social and geographical contexts in this region not only indicates potential for differential intervention dynamics but also their impact. The current study sought to establish the factors associated with virological suppression between FSW and female GP.

1.2 Statement of the Problem

Achieving viral load suppression among PLHIVs is crucial for global progression towards an epidemic control. At the individual level, continued viral load suppression is essential for immune reconstitution, mitigating advanced HIV diseases, and enhanced lifespan which is the aim of comprehensive HIV management. These patient level health outcomes are dependent not only on sustained use of highly effective ARTs, but also on access to care and treatment. However, there are gaps in knowledge regarding association of personal characteristics and viral load outcome because routine program outcomes have largely focused on aggregated data. Also, despite efforts to improve coverage of ART among PLHIV, it is still unclear how the interplay of patient's biological, clinical and social-demographic factors influences viral suppression in the context of differentiated and routine care and treatment service delivery. This has implications for implementing the HIV intervention efforts and reporting patient level outcomes among general and key populations. Evidence suggests that FSW and MSM achieved viral suppression of 98% and 99% respectively as compared to 80% in the GP in Homa Bay County (NASCOP, 2018). However, the factors that contributes to this high prevalence of viral load suppression among the KP in contrast to the general population in Homa Bay are not known. The study sought to investigate factors influencing virological suppression and how they interact to enhance sustained virological suppression.

1.3 Significance of the Study

The study brought out very interesting findings that goes a long way to benefit future programing and implementation of comprehensive HIV programs for all population types in high HIV burden counties to help in reduction of new HIV infections with an aim to achieving an epidemic control. Specifically, this research benefits the following:

Service delivery – The study provides areas of focus with HIV prevention including risky sexual behaviors, ART optimization and social demographic factors that can be tailored for KP and GP.

Policy makers – Provides a holistic opportunity on to how to design and implement social demographic (age, education and marital) appropriate HIV combination prevention policies for different populations with an aim to achieve an HIV free generation.

1.4 Objectives

1.4.1 Broad Objective

Investigate factors associated with virological suppression among HIV infected female sex workers and the general population on treatment in Homa Bay County Kenya.

1.4.2 Specific Objectives

i. To determine the association between social-demographic factors and viral load suppression among HIV infected sex workers and GPs in Homa Bay County.
ii. To determine clinical characteristics associated with viral load suppression among HIV infected sex workers and GPs on ART in Homa Bay County.
iii. To investigate the association between HIV risky behaviors and viral load suppression among HIV infected sex workers and GPs in Homa Bay County.

1.5 Hypotheses

i. Ho_1; There is no association between social demographic factors and viral load suppression among the HIV infected sex workers and general populations in Homa Bay County

ii. Ho_2; There is no association between clinical characteristics and viral load suppression among HIV infected sex workers and general populations in Homa Bay County

iii. Ho_3; There is no association between HIV risky behaviors and viral load among HIV infected sex workers and general populations in Homa Bay County.

1.6 Scope of the Study

This study was conducted among female sex workers and females in the general population of aged 15 to 54 years from three Sub Counties of Homa Bay County. A sample size of 663 respondents was carefully chosen to represent HIV positive KPs and GP accessing HIV services at the government health facilities of Homa Bay County. The research was conducted by administering a questionnaire and also conducting focus group discussions (FGD). The study was delimited to female sex workers and female GPs accessing ART service in 3 Sub Counties of Ndhiwa, Rachuonyo and Homa Bay Town within Homa Bay County, thus the populations taking ART off the integrated public health facilities were excluded. At the research design level, the study used a cross-sectional design.

1.7 Limitation of the Study

Although this study is one of its kind to look at KP and GP in a high HIV burden County and has revealed many interesting findings, the study has some limitations. The study relied on self-reported risk factors and therefore subject to misclassification. As prior studies have observed relationships between self-reported risk perceptions and virological suppression, this threat may not have been substantial. Secondly, the study only captured services provided at the study sites and could not account for services received in other facilities. There could be a possibility of those not virally suppressed getting occasional drug refills in another facility.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature on HIV and viral load suppression and provides background of factors influencing viral load suppression among the KPs and general populations. It provides a summary of available literature on the subject and puts into context the proposed study.

2.2 HIV Burden

The HIV epidemic remains a major global public health issue, with the sub-Saharan Africa having the highest burden. According to United Nations HIV/AIDS report, there are an estimated 38 million PLHIV worldwide of which 25.5 million live in the sub-Saharan Africa (UNAIDS, 2019). In 2014 the UNAIDS aimed to have 90% of PLHIV to know their HIV status, 90% of those diagnosed with HIV to be initiated on antiretroviral therapy (ART), and 90% of those on ART to achieve viral suppression by 2020 which were not achieved. These strategic goals were revised in 2018 to 95-95-95 to be achieved by 2030, with the aim of attaining HIV epidemic control by then. Attaining the 90–90–90 target would have resulted in at least 73% PLHIVs being virally suppressed, while the 2030 goals are expected to result in at least 86% of PLHIV being virally suppressed.

Although implementation of comprehensive high impact HIV and AIDS services has resulted in considerable progress on all the three aspects of the strategy across the globe since then, the envisioned targets are now off-track (UNAIDS, 2019). Of the 38 million PLHIV globally, 25.4 million people are currently on ART and that there were still 690,000 AIDS-related deaths (versus the targeted <500,000 by 2020) while 1.7 million new infections (versus the targeted <500,000 by end of 2020) were reported in 2019 (UNAIDS, 2019). Several challenges, which threaten to reverse the gains hitherto achieved, still persist with regard to increasing HIV testing, linkage and enrolling diagnosed clients to sustained ART management and retaining those initiated-on ART to ensure sustained viral load suppression.

Of special interest are key populations (KP) who are the most vulnerable groups. While Kenya has generalized data on HIV epidemic, KP still remain the key drivers of HIV infection (Musyoki et al., 2018). ART coverage in KP is markedly lower than the general population, ranging from 16% and 44% among MSM and FSW respectively (NASCOP, 2020b). According to Kenya National AIDS Control Council (2018), FSW and MSM have

been noted to achieve viral suppressions of 98% and 99% respectively. While these are highly context-based, factors that contribute to these differences remain unknown.

2.3 HIV in Key Populations

Key populations are at increased risk of HIV acquisition and/or transmission (WHO, 2014). This group includes FSW, MSM, transgender relationships, PWID and people in prison settings (UNAIDS, 2019). Globally, the burden of the HIV epidemic among KP is of greater magnitude in contrast to their counterparts in the general population and they contribute about 90% incidences of HIV infections worldwide (UNAIDS, 2019). In the Sub-Saharan Africa, KP accounts for 7-10% of new HIV infections, while in Kenya KP contributes 33% of HIV infections (De Cock et al., 2014). Literature indicate that FSW living with HIV and have undetectable virus are more likely to live longer than other HIV positive women (Baral et al., 2012).

2.4 Social-demographic Factors Associated with Viral Load Suppression

Social-demographic factors such as marital status, age, education level and key population typologies have been cited as predictors of viral load suppression. However, there have been inconsistent results pertaining to the association of these characteristics to VL suppression (Hakim et al., 2018). In terms of age, studies conducted in Kenya, Zimbabwe, Malawi, and South Africa disclosed that increase in age was associated with virological suppression (Cescon et al., 2011;Mogosetsi et al., 2018; Cherutich, et al., 2016). However, a study done in Ndhiwa, Homa Bay County on the cascade of HIV care and population viral suppression showed that age did not predict VL suppression (Maman et al., 2015). Therefore, this study sorts to investigate some of these disparities in age as predictor to viral suppression, with reference to adult females and KP receiving HIV services in a high HIV burden County of Homa Bay. Age classification for this study was based on Center for Disease and Control (CDC) categorization of HIV burden among the different age groups, where HIV statistics and programming has been tailor-made to different age groups considering their increased vulnerabilities. The study therefore considered the following age categories (15-24, 25-34, 35-44, 45-54 and 55+) for classification and their association to virological suppression among the KP and GP.

Regarding association between the level of education and employment, findings from previous studies are also inconsistent. Some studies have shown that virological non-suppression was independently associated with primary education level and increased

financial adversity in ART patients(Coker et al., 2015; Moolasart et al., 2018)while others indicate no difference (Mekuria et al., 2016; Bello et al., 2016). Critically, the study settings and population type were different in these studies hence the inconsistency. For instance, a study done in the United Kingdom a developed country by Coker et al.(2015) showed that those with below university education were not virally suppressed as compared to those conducted in developing countries. These studies also did not categorize the adult population by population type yet is has been shown that there are differences in VL suppression between the general and key populations. Therefore, the current study looked at different populations (GP and KP) education level to viral load suppression in a HIV high burden county of Homa Bay.

HIV co-infection has also been reported among the KP who have steady sexual partners and or cohabitating (WHO 2016). Reason for this co-infection and viral load suppression remain unknown. This study therefore sought to assess the association between marital status and VL suppression. Studies have shown that patients who are married or in stable relationships exhibit better VL suppression compared to single, widowed or unstable relationships, (Mogosetsi et al., 2018; Scorgie et al., 2012; Cherutich, et al., 2016) perhaps in part due to societal support that is critical for fidelity to clinic appointments and adherence to ART. Though there are numerous studies that examined marital status and viral load suppression, the studies focused on general population, KP were left out and yet they are disproportionately affected by HIV hence the focus of this study.

Viral load suppression data for different KP typologies are not broadly available and studies shows that the available data are inconsistent hence the need for this study in Homa Bay County.

2.5 Clinical Factors Associated with Viral Load Suppression

Universally, the benefit of being virally suppressed is to prolong and improve the lives of PLHIVs. This has been demonstrated to be associated with several clinical characteristics (Castel et al., 2016;Hadland et al., 2012;UNAIDS, 2017).Key clinical characteristics that haven shown to influence viral load suppression are how soon an individual is initiated on ART after diagnosis, ART adherence, ART regimen, and co-infection. The association between poor adherence and ART regimens to poor VL suppression rates are yet to be established(Castel et, al 2014; Cescon et al., 2011).

Persons with HIV who initiate treatment immediately are able to achieve viral suppression within a period of 3-6 month depending on the population type (MOH, 2018). This therefore means that immediate and timely linkage of patients with HIV on ART as well as retention on HIV treatment helps in receiving an individual immunological and clinical outcomes to virological suppression (Lancaster et al., 2017). Patterns of virological failure for people on first-line treatment compared to people taking second-line treatment have been found (Hermans et al., 2017; Tanser et al., 2017).A cross-sectional observational study conducted in Ndhiwa, Homa Bay County in 2012 showed that early initiation on ART influences VL suppression (Maman et al., 2015). In addition, a study that was done in Guinea indicated that ART regime type was associated with virological suppression thus reduction of drug resistance; and those who retained the same treatment since ART initiation were unlikely to experience virological failure (Gare et al., 2015). Whereas ART regime was established to predict VL suppression in these studies, the association in high HIV burden counties (Homa Bay) still needs to be ascertained to close the tides and contribute to an epidemic control.

Adherence to ART increases the likelihood of sustained virological control, which is critical for a reduction of HIV related morbidity and mortality. Contrariwise, poor adherence is associated with episodes of replication of the virus that leads to the development of drug resistance, treatment failure, thus preventive the effectiveness of HIV treatment. (Baral et al., 2012;Castel et al., 2016; Cescon et al., 2011;Elul et al., 2013). Poor adherence or non-adherence to treatment remains the biggest challenge to HIV management hence a serious public health concerns(Mountain et al., 2014). However, whether viral suppression is linked to whether population typology (broadly defined as general population or key population) remains an open question.

World Health Organization defines opportunistic infections as infections that are recurrent and or severe when immunity is compromised in HIV infected persons. These infections are the major clinical manifestation for PLHIVs(WHO, 2014). The prognosis of HIV disease is related to viral load (VL). Higher viral loads are directly linked to increase in patients with acute opportunistic diseases(Tan, et al., 2012). Some of the diseases found to predict with increased VL among PLHIVs on ART include malaria, tuberculosis, pneumonia and herpes simplex virus (Cherutich, et al., 2016; Moolasart et al., 2018). According to Moolasart et al. (2018), it is not known if opportunistic infections have an effect on immunity and replication of the virus among PLHIV who are on ART. Episodes of transient viremia in patients with good suppressions with long standing HIV infection and on treatment therapies may

aggravate concurrent infections that may result into high level viremia. (Moolasart et al., 2018). In addition, the link between co-infection with sexually transmitted diseases and viral suppression remains unknown. Sexually transmitted infections (STIs) are infections that are primarily transmitted through sexual contact. Most common sexually transmitted infections apart from HIV include herpes, trichomoniasis, bacterial vaginosis, gonorrhea, chlamydia, syphilis and hepatitis B virus (WHO, 2015). From literature, little is known about the effect of STI co-infections on HIV shedding from individuals patients on treatment(Champredon et al., 2015).In sum, the association between co-infection and viral suppression as a function of population type is not known.

2.6 Risky Behaviors Factors

There are a number of behavioral factors that are related with low viral suppression among PLHIVs; these include drug and substance abuse, lack of condom use, multiple sexual partners and gender based violence(McMahon et al., 2013). In a study done in South Africa, 50% of study participants who betrothed in unsafe sex practices including unprotected vaginal or anal sex without or with inconsistent condom use did not achieve virological suppression (Lecher et al., 2016). These studies, however, did not categorize condom use to give deeper understanding of the relationship of consistent condom use with viral load suppression. In cohort studies conducted among PWIDs and those using alcohol indicated that there was a low likelihood to undetectable virus (Cescon et al., 2011;Hladik et al., 2017). The studies looked at the KP and a little in known of alcohol and substance use to viral association among the GP, which is to therefore focus of this study. Previous studies focused on urban settings and special clinics which may bring the disparity in the findings; this study therefore was conducted in rural and public health facilities.

Violence against KP and GP has been revealed to be a risk factor for HIV acquisition and an impediment to positive or favorable HIV treatment outcome. Recently studies have indicated that intimate partner violence is generally experienced by majority of PLHIVs(Bello et al., 2016;Bulage et al., 2017). In a research done amongst women of color, women who had experienced violence did not experience viral suppression in contrast to their counterparts who did not experience gender-based violence. Hitches with taking ART and history of violence were noted to be significantly associated with low odds of virological suppression (Shannon et al., 2015). The distress of intimate partner violence has been revealed as vital barrier that hinders the uptake of HIV prevention and treatment services (UNAIDS 2016).

What is missing from the literature is whether it may underlie differences in viral suppression between the GP and KP.

Having multiple sexual partners like in the case of FSW in contrast to other reproductive age women, increases their chances of acquiring and transmitting HIV infections(Chen et al., 2007). A study that was done in Malawi targeting female sex works, period in sex work and number of clients per week found little or no association to treatment outcomes (Hosseinipour et al., 2017). There are gaps in knowledge on whether the same holds for the GP in the same context socio-economic and cultural ecology.

HIV infected persons who are unaware of their status have been shown to have high viral load (Cowan et al., 2017). According to KENPHIA (2018), HIV infected persons who did not know status had significantly higher levels of viral loads as compared to those who knew their HIV status. Being unaware of a HIV positive status and sub-optimal adherence are important determinants of viral load (Bulage et al., 2017). In a study done in South Africa, 50% of patients who engaged in unsafe sexual practices were not suppressed as compared to a United Kingdom study which demonstrated that sustained virological suppression was realized among people who did not have unsafe sexual practices(Cescon et al., 2011;Hermans et al., 2017).

2.7 Conceptual Framework

The current study is anchored on the Socio-Ecological Model (SEM). The SEM holds that individual decisions and behaviors result from reciprocal interactions within and between the individual's social and physical surroundings(Bronfenbrenner, 1979). The Model describes one's environment in terms of levels of influence: individual, interpersonal relationships (meaningful one-on-one interactions), organizational structures (distal influences such as group and institutional), and social/community (norms and values of cultures and subcultures or societal influences; (Bronfenbrenner, 2005). The Social-Ecological Model offers a menu of numerous effects on behavior change at different levels of the socio-ecological framework. The current study focused on individual level (micro-level) factors. These include factors individual perceptions, beliefs, or emotions. Other factors external to but which influences the individual are: *i)* Interpersonal factors including familial context such as social support and relationship satisfaction; *ii)* Community level factors including social capital or community norms; *iii)* Institutional level which focus on factors within the health system, including confidentiality, eminence of health providers and availability of resources;

lastly *iv)* the structural level including macro-level factors such as politics, climate change, education, policies implementation, laws and resources. The conceptual framework, Figure 1.1, summarizes individual-level characteristics whose association with virological suppression was investigated in this study.

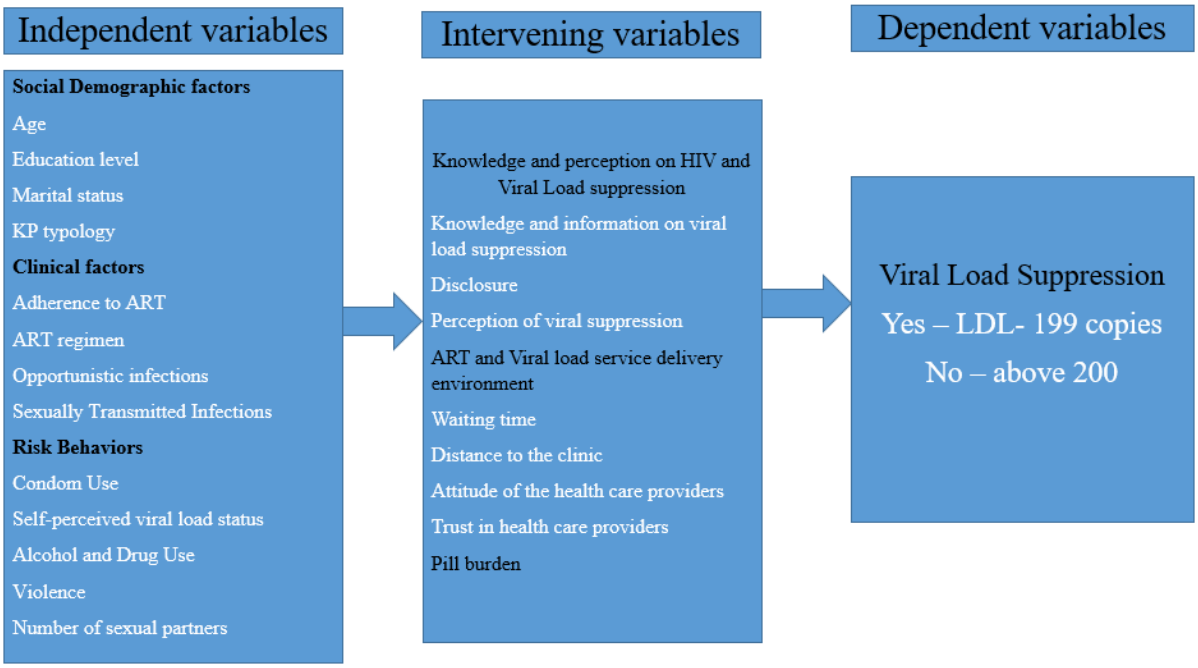

Figure 2.1: Conceptual framework of the study. Arrows indicate hypothesized link between sociodemographic factors, clinical factors and risky behaviors by people living with HIV.

CHAPTER THREE
METHODOLOGY

3.1 Introduction

This chapter describes the study area and population, sampling techniques, data collection instruments, data collection procedures, validity and reliability, data management procedures, analysis technique, presentation and ethical considerations.

3.2 Study Area and Population

The study was carried out in Homa Bay County which is located in western Kenya along Lake Victoria and lies between latitude $0^o15'$ South and $0^o52'$ South, and between longitudes 34^o East and 35^o East; Figure 3.1. The county covers an area of 4,267.1 km^2 inclusive of the water surface which on its own covers an area of 1,227 km^2. It boarders' five counties: Siaya, Kisumu, Nyamira, Kisii and Migori. According to the Kenya National Population and Housing Census of 2008/09, the Homa Bay County has a population of 1,038,858 consisting of 498,472 males and 540,386 females (KNBS, 2010). Administratively, it has eight sub counties namely Homa Bay town, Rachuonyo, Ndhiwa, Mbita, Suba, Rangwe, Rachuonyo South and Kabondo Kasipul. Fishing and Agriculture are the major economic activity with fish being the major income.

The county has 226 public health facilities; 8 are public sub-county hospitals, one county referral hospital, one thirty-eight are Public Health facilities, nineteen are Nongovernmental health facilities, 28 faith-based health centers and 32 private facilities as shown on the Figure 2 (MOH, 2015). The County has a total of 4000 individuals belonging to KP. There are 4 integrated facilities for KP and 2 standalone/static Drop in Center (DiCEs).

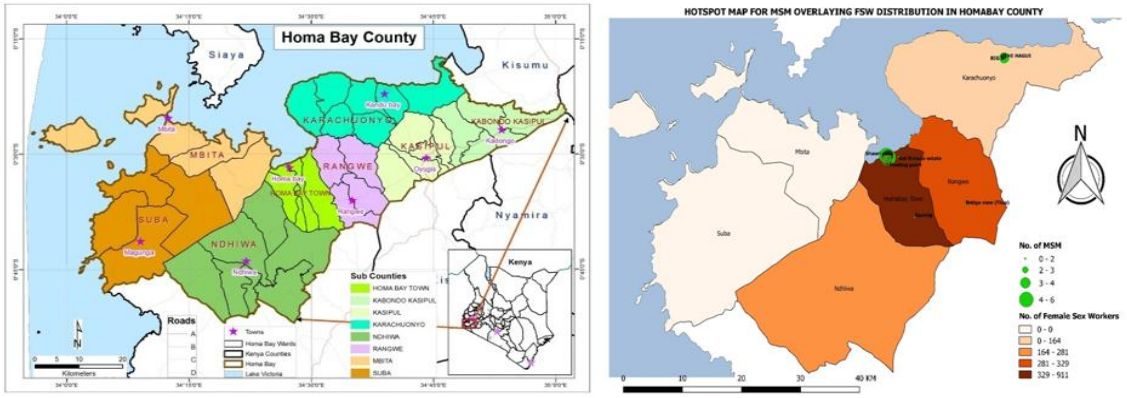

Figure 3.1: Homa Bay County Administrative and Key Population Hotspots Map

The study was conducted in the three integrated facilities in Homa Bay County. The sites are unique KP friendly service delivery points where comprehensive package of services is integrated within the mainstream government health facilities. The KP services provided entail behavioral, biomedical and structural intervention as shown in the Table 3.1.

Table 3.1: Comprehensive package of services offered to the KPs in the integrated facilities

Behavioural Intervention	Biomedical Interventions	Structural Interventions
Risk reduction counselling	HIV Testing Services	Advocacy
Peer Education	HIV Treatment services including ART provision and Viral load monitoring	Mitigation of gender violence
Condom Education and Distribution	STI screening and treatment	Drug and substance use mitigation
Psychosocial counselling	Family planning services	
	Cervical cancer and screening and treatment services	
	Provision of ART as HIV prevention including PEP and PREP	

The three integrated facilities are located in Homa Bay, Ndhiwa and Rachuonyo Sub Counties in Homa Bay County. The facilities are Makongeni Health Center situated in Homa Bay Central Sub County, Ndhiwa Hospital in Ndhiwa and Kendu Hospital in Rachuonyo. The three Sub-counties have an estimated population of 400,000 with 2,500 FSW, 218 MSM and 65 persons who inject drugs (KNBS, 2010; MoH 2013). Key populations who had been enrolled in the three integrated facilities and were receiving comprehensive package of services at the time of the study were 1550. People living with HIV attending the three facilities are 4302, with 3,551 female GP and 751 FSW. Moreover, PLHIVs in the three sites of Homa Bay, Ndhiwa and Rachuonyo Sub Counties are 406, 2110, 1405 and 520, 65, 45 GP and KP respectively. The study population was therefore 4,302 HIV positive sex workers and non-sex workers attending HIV treatment services at the three integrated facilities of Homa Bay County.

3.3 Study Design

This study used an analytical cross-sectional design. The design was used in assessing prevalence of VL among HIV infected FSW and GP to determine the association between sociodemographic, clinical factors and risky behavior on the one hand and viral suppression

on the other. The cross-sectional design was appropriate since it was used to compare different population groups (KP and GP) with data collected at the same time.

3.4 Sample Size Determination

The sampling frame comprised of 4,302, a sum of PLHIV from GPs and KPs attending the three integrated DICEs study sites. Given that the target population for this study was<10,000, finite population correction was applied using Yamane formula (1967):

$$n = \frac{N}{(1+Ne2)} \text{.....} \textit{Equation 1}$$

where;

n=corrected sample size

N= population size

e=margin of error set at 0.05

With a population of less than 10,000 among the GP and KP, the calculated required sample size by population type is therefore shown below:

GP desired sample size $= \frac{3551}{1} + 3551x0.0025 = 370$

KP desired sample size $= \frac{751}{1} + 751x0.0025 = 277.86 \sim 278$

The calculated sample sizes were then subjected to finite population correction:

$$n = \frac{n0}{1} + \frac{(\pi 0-1)}{N} \text{ ..... } \textit{Equation 2}$$

Whereas:

n_o=sample size derived from Equation 1

N=population size, 3551 GP and 751 KP

n_o=370 GP and 278 KP

$n = \frac{370}{1} + \frac{(370-1)}{3551}$ = 327x0.20 = 376 (Final GP sample size after adjustment for non-response rate of 20%)

$n = \frac{278}{1} + \frac{(278-1)}{751}$ = 235x0.20 = 287 (Final KP sample size after adjustment for non-response rate of 20%)

Variability in non-response complicates HIV outcomes for general populations according to (Marino et.al, 2018) hence in this study a none response of 20% was used to correct the sample size. Total sample size for the study was663.

Sampling size calculation from the three sites was done using stratified sampling techniques and the results are presented in Table 3.2.

Table 3.2: Stratified sampling for the three sites

SITE	GPs	(KPs)FSW	Sample size	TOTAL
MAKONGENI	415	591	270	1006
NDHIWA	2273	89	275	2362
KENDU	863	70	118	933
TOTAL	**3551**	**751**	**663**	**4,302**

N-POPULATION= 4,302

N_1: 1006 – 415 GPs and 591 KPs

n_2: 2,363 – 2273 GPs and 89 KPs

n_3: 933 – 863 GPs and 70 KPs

As calculated above, sample size for the study was663; therefore, to calculate $n_1$by population type from each stratum; the formula below was used

$$n1 = \frac{required\ sample\ size}{total\ population} x stratum\ size$$

$$n1 = \frac{376}{3551} x stratum\ size_{\text{for GPs}}$$

$$n1 = \frac{287}{751} x stratum\ size_{\text{for KP}}$$

3.5 Sampling Procedure

The three integrated facilities of Makongeni, Ndhiwa and Kendu Hospitals were selected purposively because they were the only integrated DiCES in the county. The simple random sampling technique was used to select the study participants. A pre-site visit was used to identify those who meet the inclusion criteria. A list of all HIV infected sex workers and GPs that meet the inclusion criteria was obtained, participants were assigned numbers which was then used to construct tables that guided the random selection process of HIV infected KP and GP on ART with a viral load result three months preceding the survey.

3.6 Inclusion and Exclusion Criteria

In this study eligible participants were individuals designated as KP and GP and who met the inclusion and exclusion criteria outlined below.

3.6.1 Inclusion Criteria

1. Living with HIV and having a current documented VL result from one of the three integrated facilities.
2. Minimum age 18 and consenting to be in the study.

3.6.2 Exclusion Criteria

1. Any HIV positive sex worker and GP newly enrolled at the facilities and initiated on ART. Newly identified PLHIVs may have not achieved the maximum required threshold of VL testing as required by the national guideline hence cannot be included in the study which is looking at VL suppression.

3.7 Measurement of Variables

The parameters that the study focused on were broadly categorised into independent and the dependent variables as outlined next.

- **Dependent variable:** Virological suppression (treatment outcome) – was operationalized and categorized as either suppressed - Low detectable level (LDL) (<199copies) or not suppressed (≥200copies/µL/year).
- **Independent variables.** There were three independent variables grouped into sociodemographic factors, clinical factors and risky behaviors as outlined next.

  Social demographic factors:

  - Education level: Education level was classifiedas Primary and Secondary/tertiary education levels
  - Age: Age was operationalized according to the following interval scale; 15-24 years, 25–34 years, 35 - 44years, 45 -54 years, 55 years and above.
  - Marital status: Assessed as single, married or cohabiting and separated/widowed/divorced.
  - KP typology: KP characterizations of different KP types and were classified as; Home-based and street/bar and lodging based.

  Clinical characteristics

  - Type of ART regimen or regimen switch – were categorized according to first line and second line treatment. First line was a combined therapy of Tenofovir Disoproxil fumarate, Lamivudine and Efavirenz (EFV) or Tenofovir Disoproxil fumarate, Lamivudine and Dolutegravir (DTG) while second line was Tenofovir Disoproxil fumarate, Lamivudine and Atazanavir/ritonavir

- Opportunistic infections – were those infections that affect the treatment outcomes. The study focused on Tuberculosis and pneumonia
- Adherence to ART – was measured as >95% adherence being acceptable and <95% adherence as non-adherent according to WHO (2014)
- Sexually Transmitted Infections – was assessed using syndromic management approach as vaginal, anal and urethral discharge; lower abdominal infections and genital ulcers.

Risky behaviors on VL

- Violence – was measured as individuals who had experienced physical and or sexual violence.
- Number of sexual partners – was measured based on the number and frequency of sexual partners; regular, casual or permanent sexual contacts.
- Condom use – was assessed based on self-reported condom use with every sexual activity.
- Alcohol and drug use were measured based on participants self-reported use of alcohol or drugs which was consumption of any brewed alcohol and use of any drugs or substances and was categorized into alcohol and drug users and non-alcohol and drug users

3.8 Data Collection Instruments

The data was collected using semi-structured questionnaire (Appendix II) and a focus group discussion guide (Appendix III). In addition, a data abstraction form (Appendix IV)was also used to abstract data from patients' medical records. This was done to augment variables that could not be collected using the questionnaire and the focus group discussion guide. The abstraction form contained information retrieved from existing patient level records, ART and VL databases. A data set of abstracted information containing unique identification number with no personal identifying information was maintained.

3.9 Data Collection Procedures

Research assistants (RAs) with good communication skills and of post tertiary education were selected and trained on the data collection protocol and ethical issues such as confidentiality and consenting process. An FGD guide (Appendix III) was used to conduct six focus group discussion (FGDs) among the sex workers and GP. Participants in the FGDs were grouped into 8-10 participants, equally assigned from the KP and GP groups since they

have shared characteristics pertinent to their specific groups for discussion and were led by a trained facilitator. The participants were selected from the study sites by random sampling and were grouped by population type and age. Discussions were audiotaped in addition to taking notes. FGDs were conducted at the study sites within the integrated DiCEs.

Secondary data was retrieved from existing patient level records of HIV infected study participants from the selected facilities who met the required inclusion criteria. The variables abstracted electronically from patient level databases included date of birth, type of regime, any opportunistic infections and viral load count.

3.10 Data Management

Data entry: Data from the survey was entered into databases created with SPSS V.20.0. A double-data entry system was utilized for accuracy and comparison and data cleaning was done by comparing the data entered with the source documents.

3.11 Validity and Reliability

Validity and reliability increase transparency, and decrease opportunities for researcher bias in qualitative research (Singh et al., 2016). The survey tool was pre-tested in Mbita KP stand-alone DiCE and Mbita Sub County Hospital in Homa Bay County to ascertain reliability and validity of the questionnaires. Mbita Sub County Hospital and KP drop-in center were selected for pretest given the similarities in KP related service provision activities characterized by combination HIV prevention services. A questionnaire was administered to 67 respondents, at least 10% of the study sample size (Connelly, 2008).

To measure internal consistency of the questionnaire, Cronbach alpha was used and was found to 0.9. Usually a Cronbach alpha value of $\alpha \geq 0.9$indicatesa perfect or excellent reliability, while $\alpha \geq 0.70$ is considered as being of good or acceptable reliability and that of $\alpha \leq 0.70$ to $\alpha \geq 0.5$ is regarded as low, poor reliability with $\alpha \leq 0.5$ considered as unacceptable reliability(Hair Jr et al., 2010). Moreover, validity of the research instruments was measured using the Amin's content formula (Content Validity Index = Number of judges declaring item valid over the Total number of items). An average index score of 0.83 was yielded indicating that the instruments was measuring what it was supposed to measure (Amin M.E, 2005).

Data validity in qualitative studies was enforced through the principle of data triangulation, which involved using two or more different sources of information in order to increase the validity of the results of data collection effort(Guest, 2017). The study compared information and data gathered from both interviews and FGDs especially for objective 3.

3.12 Data Analysis

The questionnaires were cleaned, checked for completeness and coded to represent specific responses to the questions after data collection. Chi-square test of independence was used to test association of the independent variables (age, education, typologies, marital status, adherence, ART regime, opportunistic infections, STIs, violence, alcohol and drug use, condom use and number of sexual partners) and viral load (measures as suppressed or not suppressed). Significant associations were subjected to logistic regression so as to determine odds ratios. Statistical significance was assessed at $p \leq 0.05$.Relevant qualitative information on risk behavior and awareness of VL suppression were reported verbatim.

3.13 Ethical Considerations

Necessary approvals were sought to conduct the study. Maseno University Ethics Review Committee (Appendix VII) provided ethical approval whereas the County Government of Homa Bay (Appendix IX) also provide an authorization to conduct the research. Research authorization was also obtained from NACOSTI (Appendix VIII). Informed consent (Appendix I) was sought from prospective study participants after they were provided with full information about the study. Confidentiality was ensured through deidentifying personal details using codes. Information of the study participants was kept in password-protected computers, which are stored in a place with restricted access. Participation in the study was voluntary, risk and benefits of the study was explicitly explained, privacy was upheld during interviews and participants were allowed to withdraw at any point. Data, including questionnaire and files of study participants were kept in cabinets under lock and key by the principal investigator. Their identities were kept confidential and their names were not used in any report and presentations during data dissemination.

CHAPTER FOUR

RESULTS

4.1 Introduction

This chapter presents results obtained from the sample survey through questionnaires and focus group discussions. A total of663study participants participated in the study resulting in 100% response rate. In addition, 40 participants were taken through FGD. Of those who participated in the study, 57% were from the GP and 43% from KP.

The mean age was 38.4 years (SD=6.9) for the KP and 35.4. years (SD=7.6) for the GP; range 18-49 years with 40-45 years being identified as modal population age group comprising 25.4% KP and 19.4% GP. Of all participants, 66.8% GP and 71.1% KP had primary education; 27.3% GP and 26.1% KP having secondary and 5.8% GP and 2.8% KP had tertiary level. Among KP 36.6%were divorced, separated or widowed; 28.9% married or cohabiting; 34.5% single; while for GP 27.1% were divorced, separated or widowed; 60.5% married or cohabiting and 12.5% single. By KP typology 39.4% were street based, 27.5% lodging based and 33.1% home based (Table 4.1).

Table 4.1: Socio-demographic, clinical and treatment characteristics of study participants of FSWs and GPs PLHIVS in Homabay County

Key study variables	GP n (%)	KP n (%)	Total
Social and Demographic characteristics			
Age-group			
15-24 years	32 (8.5)	13 (4.5)	45(6.5)
25-34 years	146 (38.8)	62(21.6)	208(30.4)
35-44 years	145 (38.5)	146(50.8)	291(44.7)
45-54 years	54 (14.2)	66(23.1)	120(18.4)
Education level			
Primary	252 (66.8)	204 (71.1)	456 (68.7)
Secondary	103 (27.3)	75 (26.1)	178 (26.8)
Tertiary	22 (5.8)	8 (2.8)	30 (4.5)
Marital status			
Divorced, separated or widowed	102 (27.1)	105 (36.6)	207 (31.2)
Married or cohabiting	228 (60.5)	83 (28.9)	311 (46.8)
Single	47 (12.5)	99 (34.5)	146 (22.0)
KP Typology - Area of operation			
Home based		95 (33.1)	95 (14.3)
Lodging based		79(27.5)	79(11.3)
Street based		113(39.4)	113(17.8)
Clinical Characteristics			
ART duration – Years			

<3	108 (28.6)	78 (27.2)	186 (28)
3-5	92 (24.4)	97 (33.8)	189 (28.5)
6+	177 (46.9)	112 (29)	289 (43.5)
Missed taking ART drugs			
Yes	172 (45.6)	154 (53.7)	326 (49.1)
No	205 (54.4)	133 (46.3)	338 (50.9)
Duration of Missing ART (Days)			
<10	129 (34.2)	92 (32.1)	221 (33.3)
11+	248 (65.8)	195 (67.9)	443 (66.7)
Can't remember the of days missed drugs	42.0 (14.0)	33.0 (8.8)	75.0 (11.1)
Did not miss taking ART	137.0 (45.8)	0.0 (0.0)	340.0 (50.3)
Reasons for missing ART			
Did not remember	106 (28.1)	37 (12.9)	143 (21.6)
Took alcohol	14 (3.7)	29 (10.1)	43 (6.5)
Did not want sexual partner to see drugs	13 (3.4)	43 (15)	56 (8.4)
Can't remember reason	40 (10.6)	37 (12.9)	77 (11.6)
Did not miss taking ART	1 (0.3)	8 (2.8)	9 (1.4)
	203 (53.8)	132 (46.2)	335 (50.5)
Adherence			
Good	294 (78)	183 (63.8)	477 (71.8)
Fair	69 (18.3)	85 (29.6)	154 (23.2)
Poor	14 (3.7)	19 (6.6)	33 (5)
Type of ART regimen - Reported			
AF2A		2 (0.7)	2 (0.3)
AF2B		18 (6.3)	18 (2.7)
AZT3TCATVr		10 (3.5)	22 (3.3)
TDF3TCARTvr	12 (3.2)	9 (3.1)	33 (5)
TDF3TCDTG	24 (6.4)	41 (14.3)	194 (29.2)
TDF3TCEFV	153 (40.6)	199 (69.3)	383 (57.7)
TDF3TCNVP	184 (48.8)	8 (2.7)	8.0 (1.2)
Regimen switch			
Yes	40 (10.6)	39 (13.6)	79 (11.9)
No	337 (89.4)	248 (86.4)	585 (88.1)
Current ART regimen			
First	337 (89.4)	257 (89.5)	594 (89.5)
Second	40 (10.6)	30 (10.5)	70 (10.5)
Current ART regimen - documented			
TDF+3TC+DTG	72 (19.1)	75 (26.1)	147 (22.1)
TDF+3TC+EFV	247 (65.5)	152 (53)	399 (60.1)
Others	58 (15.4)	60 (20.9)	118 (17.8)
Suffered from TB or Pneumonia in the past one year			
Yes	83 (22)	60 (20.9)	143 (21.5)
No	294 (78)	227 (79.1)	521 (78.5)

Suffered from STIs in the past 6 months			
Yes	85 (22.5)	146 (50.9)	231 (34.8)
No	292 (77.5)	141 (49.1)	433 (65.2)
Risky Behaviors			
Number of Sexual partners in the past one year			
None	56 (14.8)	0 (0)	56 (8.3)
1	276 (73.2)	1 (0.3)	277 (41.7)
>2	45 (11.9)	286 (99.7)	331 (49.8)
Type of sexual partners			
Casual	27 (7.2)	242 (84.3)	269 (40.5)
Permanent	198 (52.5)	0 (0)	198 (29.8)
Regular	96 (25.5)	45 (15.7)	141 (21.2)
NA	56 (14.9)	0 (0)	56 (8.4)
Condom use			
Yes	215 (57)	230 (80.1)	
No	97 (25.7)	13 (4.5)	445 (67.0)
Sometimes	26 (6.9)	44 (15.3)	110 (16.6)
NA	39 (10.3)	0 (0)	70 (10.5) 39 (5.9)
How often do you use these condoms			
Always	122 (32.4)	141 (49.1)	263 (39.7)
Sometimes	119 (31.6)	132 (46)	251 (37.9)
Never	6 (1.6)	6 (2.1)	12 (1.8)
NA	129 (34.3)	8 (2.8)	137 (20.7)
How often do you negotiate for condom use with casual sexual partners			
Always	50 (13.3)	211 (73.5)	261 (39.3)
Sometimes	12 (3.2)	57 (19.2)	69 (10.4)
Never	0 (0)	9 (3.1)	9 (1.4)
NA	315 (83.6)	10 (3.5)	325 (48.9)
How often do you negotiate for condom use with regular sexual partners			
Always	51 (14.2)	144 (50.2)	195 (30.2)
Sometimes	44 (12.3)	127 (44.3)	171 (26.5)
Never	15 (4.2)	9 (3.1)	24 (3.7)
NA	248 (69.3)	7 (2.4)	255 (39.5)
How often do you negotiate for condom use with permanent/spouse sexual partners			
Always	65 (17.7)	67 (23.3)	132 (20.2)
Sometimes	109 (29.6)	110 (38.3)	219 (33.4)
Never	59 (16.0)	87 (30.3)	146 (22.3)
NA	135 (36.7)	23 (8)	158 (24.1)

Do you drink alcohol or use any other substance drugs			
Yes	72 (19.1)	191 (66.6)	263 (39.6)
No	305 (80.9)	96 (33.4)	401 (60.4)
Ever missed ART drugs while under the influence of alcohol and other drugs			
Yes	41 (51.2)	83 (42.8)	124 (45.3)
No	39 (48.8)	111 (57.2)	150 (54.7)
Ever missed any clinic appointments while under the influence of drugs			
Yes	26 (35.6)	46 (23.6)	72 (26.2)
No	47 (64.4)	149 (76.4)	196 (73.1)
Have you experienced any form of violence in the last one year			
Yes	67 (17.8)	120 (42.1)	187 (28.2)
No	310 (82.2)	165 (57.9)	475 (71.8)
If yes, what form of violence			
Physical	45 (11.9)	78 (27.2)	123 (18.5)
Sexual	23 (6.1)	42 (14.6)	65 (9.8)
NA	309 (82.0)	167 (58.2)	476 (71.7)
Has this violence in any way made you miss your clinic appointment or drugs			
Yes	17 (4.5)	37 (12.9)	54 (8.1)
No	48 (12.7)	67 (23.3)	115 (17.3)
Not sure	0.0 (0.0)	2 (0.7)	2 (0.3)
NA	312 (82.8)	177 (61.7)	489 (73.6)
None Response	0.0 (0.0)	4 (1.4)	4 (0.6)

Key of the abbreviations in table 4.1 include KP =Key population, GP = General Population, ART= Anti-Retrieval Therapy, NA= Not Applicable, TDF=Tenofovir Disoproxil fumarate, DTG= Dutegravine, EFV=E favirenzes, 3TC=Lamivudine and ARvir=Atazanavir/ritonavir

4.2 Association between Social-demographic Factors and Viral Load Suppression among HIV Infected Sex Workers and GP in Homa Bay County

Of the KP participants who had high viral load, a significant majority had primary education level (81.3%; X^2 = 2.1804;*P*=0.045) and operated as home-based sex workers(75%; X^2 = 13.6036;*P*=0.001).Comparatively, the GP's with high viral load among participants with primary level education level(61.5%; X^2 = 4.6977;*P*=0.095); Table 4.2.Age predicted VL suppression among GP. In both populations, age of 35-44 years had higher proportions of VL suppressions (51.3%; X^2 = 7.2054;*P*=3.012) among KPs as compared to (37.8%; X^2 = 3.0218;*P*=0.036) among the GP. Marital status was not statistically significant across populations, however those who were married and or cohabiting, 31.3% KP and 59% GP did

not suppress in contrast to the single or divorced. In regression analysis the odds for participants' viral load suppression was not statistically different across the education levels because of statistical distribution. By KP typology, the ORs for good suppression were higher for sex workers who operated at lodgings(OR 4.226, 95% CI 2.067 - 8.642,p< 0.0001) and those who were street based (OR 3.538, 95% CI 1.764 - 7.098,p< 0.0001) compared to home based (Table 4.5)

Table 4.2: Association between social and demographic factors and virological suppression in the key and general population living with HIV in Homa Bay County

	Key Population				General Population			
	LVL	HVL			LVL	HVL		
	n (%)	n (%)	Chi-value	P-Value	n (%)	n (%)	Chi-value	P-Value
Age								
15-24 years	11 (4.1)	2 (12.5)			29(8.6)	3(7.7)		
25-34 years	60 (22.2)	2 (12.5)			134(39.7)	12(30.8)		
35-44 years	139(51.3)	7 (43.8)	7.2054	0.302	128(37.8)	173(43.6)	3.0218	0.036
45-54 years	61(22.5)	5 (31.3)			47(19.9)	7(17.9)		
Education level								
Primary	191(70.5)	13(81.3)			228(67.5)	24(61.5)		
Secondary	73(26.5)	2(12.5)	2.1804	0.045	88(26)	15(38.5)	4.6977	0.095
Tertiary	7(2.6)	1(6.3)			22(6.5)	0 (0)		
Marital status								
Divorced, separated or widowed	101 (37.3)	4(25)			89(26.3)	13(33.3)		
Married or cohabiting	78(28.8)	5(31.3)	1.0742	0.584	205(60.7)	23(59)	1.4453	0.485
Single	92(33.9)	7(43.8)			44(13)	3(7.7)		
If KPs where do mostly operate or meet your clients								
Home based	83(30.6)	12(75)						
lodging based	78(28.8)	1(6.3)	13.6036	0.001				
Street based	110(40.6)	3(18.8)						

4.3 Clinical characteristics associated with viral suppression among HIV infected sex workers and GPs in Homa Bay County

4.3.1 Clinical Characteristics

Median time on ART was 4 years (range 1-20 years) for both KP and GP with majority (56.5%) of study participants' duration on ART being below 5 years. ART regime switch was reported for 13.6% KP and 10.6% GP. The most common ART regimen was TDF/3TC/EFV at 69.3% KP and 48.8% GP. Of the study participants taking ART, 63.8% KP and 78%GP reported good adherence. Of those with TB or pneumonia, KPs comprised 20.9% versus 22% of GP. The most common STI (based on syndromic management approach) across the study participants was Lower Abdominal Pain (LAP) KP were 42.9% and GP17.5% (Table 4.1)

4.3.2 Clinical Characteristics Associated with Virological Suppression

Anti-retroviral regime (KP 95.5%, $X^2 = 42.365$; $P<0.0001$; GP 89.9%, $X^2 = 11.1667$; $P=0.025$). ART adherence($X^2 = 106.4599$; $P<0.0001$; GP $X^2 = 33.8846$; $P<0.0001$) and missing ART drugs for more than 11 days(KP $X^2 = 64.9757$; $P<0.0001$; GP $X^2 = 44.442$; $P<0.0001$) were significantly associated with VL suppression in both populations. In contrast, Opportunistic infections($X^2 = 8.6742$; $P=0.003$), duration on ART ($X^2 = 33.400$; $P<0.004$) and regime switch ($X^2 = 26.2631$; $P<0.001$)was only associated with VL suppression in the KP; Table 4.3

Logistic regression analysis demonstrated that the Odds of not being virally suppressed was high for KP with poor adherence (OR 65.5332, 95% CI 7.850-547.079, p< 0.0001)compared to GP (OR 21.87499, 95% CI 4.163-114.95, p< 0.0001) regardless of the length of days of missed ART (>11days; OR 6.80998, 95% CI 0.556-83.378, p> 0.133) as compared to GPs with missed ART >11days (OR 21.87499, 95% CI 4.163-114.95, p< 0.0001) than those with fair adherence. KP who also had TB/Pneumonia had lower ODDs of being virally suppressed (OR 0.5638623, 95% CI 0.082-3.873, p> 0.560) (Table 4.5)

Table 4.3: Association between clinical characteristics and virological suppression in key and general population living with HIV in Homa Bay County

	Key Population				General Population			
	LVL	HVL			LVL	HVL		
	n	n	Chi-value	P-Value	n	n	Chi-value	P-Value
How long have you been on ART - Years								
<3	72(26)	6(37.5)			92(27.3)	16(41)		
3 to 5	128(47.3)	2(12.5)	33.4003	0.004	105(31)	16(41)	24.9332	0.051
6+	71(26.2)	8(50)			141(41.7)	7(18)		
Have you ever missed taking your ART drugs								
Yes	141(52)	13(81.3)	5.1877	0.023	148(43.8)	24(61.5)	4.4413	0.035
No	130(48)	3(18.8)			190(56.2)	15(38.5)		
If yes for how many days did you miss taking your drugs - Days								
<10	95(33.7)	1(6.3)			108(32.1)	16(31)		
11+	15(5.7)	6(37.6)	64.9757	0.000	0(0)	26(30.3)	44.442	0.000
Can't remember days missed drugs	35(12.6)	6(37.5)			30(12.6)	3(7.7)		
Did not miss taking ART	130(48)	3(18.6)			187(55.3)	16(31)		
What made you miss taking your ART drugs								
Did not remember	36(13.3)	1(6.3)			97(28.7)	9(23.1)		
Took alcohol	28(10.4)	1(6.3)			10(3)	4(10.3)		
Did not want sexual partner to see drugs	39(14.4)	4(25)			7(2.1)	6(15.4)		
Can't Remember reason	31(11.5)	6(37.5)	13.3421	0.023	36(10.7)	4(10.3)	24.8293	0.000
Not Sure	7(2.6)	1(6.3)			1(0.3)	0(0)		
Did not miss taking ART	129(47.8)	3(18.8)			187(55.3)	16(41)		
Adherence								
Good	181(66.8)	2(12.5)			275(81.4)	19(58.7)		

Fair	82(30.3)	3(18.8)	106.4599	0.000	56(16.6)	13(33.3)	33.8846	0.000
Poor	8(3)	11(68.8)			7(2.1)	7(17.9)		
Was the Regimen switched								
Yes	30(11.1)	9(56.3)			34(10.1)	6(15.4)		
No	241(88.9)	7(43.8)	26.2631	0.000	304(89.9)	33(84.6)	1.0455	0.307
What is the current ART regimen								
First	250(92.3)	7(43.8)			304(89.9)	33(84.6)		
Second	21(7.7)	9(56.3)	37.9679	0.000	34(10.1)	6(15.4)	1.0455	0.307
What is the current ART regimen name								
TDF+3TC+DTG	72(26.6)	3(18.8)			65(19.2)	7(17.9)		
TDF+3TC+EFV	145(53.5)	7(43.8)	2.8567	0.240	225(66.6)	22(56.4)	3.5551	0.169
Others	54(19.9)	6(37.5)			48(14.2)	10(25.6)		
Have you suffered from TB or Pneumonia in the past one year - cough lasting more								
Yes	52(19.2)	8(50)			70(20.7)	13(33.3)		
No	219(80.8)	8(50)	8.6742	0.003	268(79.3)	26(66.7)	3.2452	0.072
Have you had or suffered from STIs in the past 6 months								
Yes	138(50.9)	8(50)	0.0051	0.943	78(23.1)	7(17.9)	0.5266	0.468
No	133(49.1)	8(50)			260(76.9)	32(82.1)		

4.4 Association between HIV risky behaviors and VL suppression among HIV infected sex workers and GPs in Homa Bay County

4.4.1 Risky behaviours

Almost all KP and 11.9%GPhad more than two sexual partners, with KP 84.3% and GP 7.2% having casual partners; 15.7% of KP and 25.5% of the GP had regular partners with only 52.5% GP having permanent sexual partners. Eight percent of KP and 26% reported not using condoms. Key populations who reported using condoms sometimes was 46% as compared to 31.6% in the GP. More than half of the KP (66.6%) reported having used alcohol and drug use in contrast to 19.1% in the GP; with 42.1% of the KP reported having experienced violence were as compared 17.8% in the GP.(Table 4.1)

4.4.2 Risky behaviours Associated with viral Load Suppression

Among the KP, there was a significant association between the nature of sexual partner, condom use, frequency of condom use, negotiation of condom use, how often they engaged in negotiated condom use on the one hand and VL suppression on the other. With regards to the GP, there was significant association only between whether they negotiated condom use, experienced gender-based violence and alcohol consumption and VL suppression; Table 4.4.Condom use among other preventive measures was quoted by majority of the respondents as the easiest and the most widely used prevention method and was thought of as one of the most effective one to help them protect their sexual partners in a qualitative discussion…

"As a sex worker, I prefer it because it easy to use. In a night I could meet up to six clients and with condoms I don't have to do much of hygiene in my vaginal area" (a KP from Makongeni)

Alcoholism was also reported by respondents to be a possible barrier to VL suppression. The respondents reported that alcohol would make one forget to take medication when drunk while a few others however saw no problem with alcohol if it's taken in appropriate quantity: …

"Suppose I was an alcoholic, if I was supposed to take medication at 9pm and I get to the house at midnight, I would miss and that would make the virus replicate" (a KP woman from Ndhiwa)

Knowledge of viral load suppression was statistically significant among both populations57.1% of the KP ($X^2 = 11.4259$; $P=0.022$) and 57.7% in the GP ($X^2 = 51.6146$; $P<0.0001$) who reported healthy life/long life/Good health/looking beautiful and suppressed as compared to 33.3% KP and 66.7% GP who reported not knowing about viral load suppression Table 4.4.In qualitative

information regarding participants' self-perception/understanding of viral load suppression, nearly all the respondents had a commendable understanding of VL, one respondent reports…

"Viral load is the amount of HIV virus in the blood of an infected person.... when it is low, one can avoid opportunistic infections" (a GP woman from Ndhiwa)

In addition, the respondents reported that being virally suppressed keeps away opportunistic infections making one feeling healthier…

"when I take my medications as prescribed and keep a good diet, I will be virally suppressed. When I get to be virally suppressed, it means my body can successfully fight off opportunistic infections. There will be no signs on my body to show that I am HIV positive" (a GP woman from Kendu)

The ORs for non-suppression was higher among GPs (OR 0.99, 95% CI 1.979-53.618, p> 0.033) who experienced GBV as compared to KPs (Table 4.5).

Table 4.4: Association of risky behaviors to virological suppression among HIV infected female sex workers and general populations in Homa Bay County

	Key Population				General Population			
	LVL	HVL			LVL	HVL		
	n (%)	n (%)	Chi-value	P-Value	n (%)	n (%)	Chi-value	P-Value
How many sexual partners have you had in the past one year								
0	0(0)	0(0)			49(14.5)	7(17.9)		
1	1(0.4)	0(0)	0.0592	0.808	251(74.3)	25(64.1)	2.44	0.486
2	270(99.6)	16(100)			38(11.2)	7(17.9)		
Who are sexual partners								
Casual	232(85.6)	10(62.5)			21(6.2)	6(15.4)		
Permanent	0(0)	0(0)	6.1024	0.013	184(54.4)	14(35.9)	7.1566	0.067
Regular	39(14,4)	6(37.5)			84(24.9)	12(30.8)		
Do you use protection (condoms) during sexual intercourse								
No	220(81.2)	10(60.5)			192(56.8)	23(59)		
Yes	10(3.7)	3(18.3)	8.3518	0.015	87(25.7)	10(25.6)	0.3648	0.947
Sometimes	41(15.1)	3(18.3)			23(.6.8)	3(7.7)		
NA					36(10.7)	3(7.7)		
How often do you use these condoms								
Always	134(49.4)	7(43.8)			114(33.8)	8(20.5)		
Sometimes	126(46.6)	6(37.5)	16.209	0.001	101(30)	18(46.2)	5.509	0.138
Never	6(2.2)	0(0)			6(1.8)	0(0)		
NA	5(1.8)	3(18.8)			116(34.4)	13(33.3)		

How often do you negotiate for condom use with casual sexual partners								
Always	204(75.3)	7(43.8)			42(12.4)	8(20.5)		
Sometimes	52(19.2)	5(31.3)	11.8402	0.008	9(2.7)	3(7.7)	5.2229	0.073
Never	7(2.6)	2(12.5)			0(0)	0(0)		
NA	8(3)	2(12.5)			287(84.9)	28(71.8)		
How often do you negotiate for condom use with regular sexual partners								
Always	141(52)	3(18.8)			45(14.1)	6(15.4)		
Sometimes	117(43.2)	10(62.5)	10.3572	0.016	35(11)	9(23.1)	14.6336	0.002
Never	7(2.6)	2(12.5)			10(3.1)	5(12.8)		
NA	6(2.2)	1(6.3)			229(71.8)	19(48.7)		
How often do you negotiate for condom use with permanent sexual partners								
Always	65(24)	2(12.5)			62(18.7)	3(8.1)		
Sometimes	109(40.2)	1(6.3)	16.6307	0.001	96(29)	13(35.1)	2.7774	0.427
Never	75(27.7)	12(75)			52(15.7)	7(18.9)		
NA	22(8.1)	1(6.3)			121(36.6)	14(37.8)		
Do you drink alcohol or use any other addictive drugs								
Yes	182(67.2)	9(56.3)			54(16)	18(46.2)		
No	89(32.8)	7(43.8)	0.8076	0.369	284(84)	21(53.8)	20.609	0.000
Have you experienced any form of violence in the last one year								

Yes	112(41.6)	8(50)			38(11.2)	1(2.6)		
No	157(54.4)	8(50)	0.4334	0.510	300(88.8)	38(97.4)	2.8394	0.092
If yes, has this in any way made you miss your clinic appointment or drugs								
Yes	34(12.5)	3(18.8)			16(4.7)	1(2.6)		
No	62(22.9)	5(31.3)			47(13.9)	1(2.6)		
Not sure	2(0.7)	0(0)	1.6332	0.803	0(0)	0(0)	4.6686	0.097
NA	169(62.4)	8(50)			275(81.4)	37(94.9)		
None Response	4(1.5)	0(0)			0(0)	0(0)		

Table 4.5: Regression analysis showing factors associated with virological suppression among HIV infected sex workers and general populations in Homa Bay County.

		Key Population				General Population			
		Odds Ratio	P-Value	95% CI		Odds Ratio	P-Value	95% CI	
Education	Primary (Ref)	1				1			
	Secondary	1.039	0.973	0.115	9.410	1.858	0.118	0.855	4.036
	Tertiary	1.825	0.747	0.047	70.848	1	-		
KP Typology	Homebased (Ref)	1				-			
	Lodging	4.226	0.000	2.067	8.642				
	Street based	3.538	0.000	1.764	7.098				
Duration Missed ART	<10 (Ref)	1				1			
	11+	6.810	0.133	0.556	83.378	0.758	0.531	0.318	1.807
Adherence	Good (Ref)	1				1			
	Fair	1.941	0.547	0.224	16.854	3.341	0.008	1.370	8.145
	Poor	65.533	0.000	7.850	547.076	21.875	0.000	4.163	114.952
Switched Regimen	Yes (Ref)	1				1			
	No	0.249	0.111	0.045	1.380	2.013	0.299	0.538	7.528
Current Regimen	TDF+3TC+DTG(Ref)	1				1			
	TDF+3TC+EFV	0.828	0.866	0.092	7.394	0.741	0.545	0.280	1.958
	Others	2.520	0.392	0.304	20.904	1.482	0.496	0.477	4.600

Suffered TB or pneumonia	Yes (Ref)	1				1			
	No	0.563	0.56	0.082	3.873	0.62	0.277	0.262	1.469
Used Protection	Yes (Ref)	1				1			
	No	0.841	0.948	0.005	147.382	0.99	0.984	0.389	2.519
	Sometimes	1.638	0.712	0.120	22.457	0.44	0.384	0.070	2.788
	NA	-	-			0.805	0.756	0.206	3.153
Experienced violence	Yes (Ref)	1				1			
	No	0.660	0.678	0.092	4.712	5.2	0.033	1.139	23.731
Condom with casual Partner	Always (Ref)	1				1			
	Sometimes	2.518	0.429	0.256	24.818	1.512	0.674	0.221	10.360
	Never	9.554	0.458	0.025	3688.055	0.574	0.326	0.190	1.738
	NA	10.705	0.149	0.427	268.383	-	-		
Constant		0.007	0.009	0.0001	0.291	0.023	0.004	0.002	0.291

CHAPTER FIVE
DISCUSSION

5.1 Introduction

Homa Bay County leads nationally with the highest HIV incidence of 8.2% (4,558) and an overall prevalence of 19.6%amongst15-64 years of adult population(NASCOP, 2020b).The proportion of those on ART stands at 79% out of the total 138,921 adults with HIV. Of those taking ART, viral load suppression stands at 79%(NASCOP, 2020b). This study showed that viral suppression was statistically significant by population type(p=0.027) with 94.5% (n=271) of KP being virally suppressed compared to 89.4% (n=338) among the GP.

5.2 Socio-demographic Factors Associated with Virological Suppression among HIV Infected sex Workers and GPs in Homa Bay County

Social and demographic characteristicssignificantly associated with viral suppression among KP were level of education and KP typology. However, when subjected to regression analysis, only KP typology yielded significant results: significant odds for street-based and lodging based compared to home based. In contrast, in the GP, only age was significantly associated with viral suppression. The modal age-group for both groups was 35 – 44 years. Among the GPs, at least 60% were married or cohabiting, while among KPs, about 28.9% were married or cohabiting.

As this study denotes, there was an association between age and virological suppression for GP. Studies conducted in Kenya (Cherutich et al., 2016) and Zimbabwe and South Africa (Mogosetsi et al., 2018) using nationally representative samples indicated that older groups had better suppressions than younger age groups. In contrary with multistage cluster study age was not associated viral load suppression (Maman et al., 2015). However, this study did not compare the KP and GP age groups with suppression rates. The observed difference on the influence of age might have been due to contexts or methodology of the study because age might confound the outcomes (Hakim et al., 2018). Education was an important determinant of VL suppression among KPs. Those with at least post primary education level were better suppressed. This could be more related to awareness of their HIV status (Bello et al., 2016), the importance of HIV treatment and knowledge of being virologically suppressed to their lives and future (Mogosetsi et al., 2018). Previous studies in Africa among the general populations, established that education period had high significant positive associations and regressions with VL suppression.

The findings in this study was noted to be in tandem with studies done in Africa, that showed that post primary education was associated with VL suppression in patients taking ART (Coker et al., 2015; Moolasart et al., 2018). KPs have increased vulnerabilities due to low social status, associated stigma, low self-esteem, lack of education, societal insolences, poverty, rejections, family responsibility and pressures, poor health, criminalized laws and legal restrictions (Hakim et al., 2018; World Health Organization, 2016). These factors often contribute towards problems in accessing health services and treatment (UNAIDS, 2019a; Musyoki et al., 2018). A study by Shannon et al., (2014) documented KP's low access to STI services and largely women who suffer from STIs. Homebased sex workers were less likely to undertake interventions considering the social-structural contexts in addition to having other hidden innate characteristics. For example, different typologies have been associated with complex sexual network or partner (Schneider et al., 2013; Smith et al., 2015; Moller et al., 2015) which further complicates HIV dynamics and sexual networks in this County. KP typologies are still emerging yet, poorly characterised and understudied.

In the current study, single, divorced and widowed were significant greater in proportion than those married. Multiple studies have established that married KP and GP considerably contribute in driving the spread and sustenance of HIV/STIs as bridging populations – defined as "a subgroup of people who have sexual contact with both KP and the general population such as MSM married to women, clients of FSW and non-client sexual partners of FSW" (WHO, 2015; Millett et al., 2012; Friedman et al., 2014; Shah et al., 2014; Cassels et al., 2017) – a public health target for HIV risk reduction interventions. Studies using national populations in Kenya (Cherutich et al., 2016) and Malawi (Mogosetsi et al., 2018) have shown that those married or in stable relationships exhibited good rates of viral load suppression as compared to their counterparts in non-committing relationships, single or widowed. However, this study recorded that 31.3% of KP and 59% of GP did not suppressed as compared to other marital categories. The unsafe sex practices and lack of other preventive measure such us unprotect sex, having sex with a partner of unknown status, lack of pre-exposure prophylaxis, circumcision and untreated STIs and intimate partner violence may be contributors to non-suppression rates. Despite HIV programs in Kenya, there could be programmatic lapse and poor behavioral issues that needs to be understood with regards to people who are married and those cohabiting.

5.3 Clinical Characteristics Associated with Virological Suppression of HIV Infected Sex Workers and GPs on ART in Homa Bay County

Clinical characteristics significantly associated with virological suppression in both populations include; ART regime, ART adherence and missing ART for more than 11 days. While opportunistic infections, duration on ART, and regime switch were significantly associated with viral load among KP only.

Adherence measures including missing ART, duration of missing ART including health providers' records of patients' fair, good and poor adherence were significantly associated with viral load suppression. However, duration of missed ART and poor adherence were significantly associated with non-suppressed VL in multivariate analysis among both populations. Worth noting, previous study of adherence have reported considerable limitations with adherence measurement tools (Castel et al., 2016) while the current study relied on self-report which is often used in HIV treatment in Kenya. Assessment of adherence is still problematic in routine ART management or systematic research. In view of this, Kenya is currently adopting technology of electronic appointment systems in Kenya Electronic Medical Records, the technology will minimise the need on the provider compliance with the guidelines (Muinga et al., 2018). Additionally, case managers and peer navigators are being recruited to compliment ART service uptake towards achieving the UNAIDS global epidemic control goals. These newer approaches may help elicit additional VL control factors hitherto unobserved.

With regards to ART regime, the findings can be compared to previous studies. Conversely, a considerable proportion of participants, mainly KPs, still had high viral load despite regimen switch with moderate to good adherence, probably due to unobserved factors. Longer duration of missing treatment was only significant factor in virologic failure among GP. These findings are similar to those observed from a previous prospective large cohort study of female sex workers (FSW) (Gare et al., 2015). Whereas regime switches are often considered a pointer to ART optimization, the current study indicates that multiple other latent factors or interaction pathways might further influence treatment outcomes, particularly among KP. Despite the ART switch among participants in this study, 56.3% KP and 15.4% GP did not suppress as compared to those who suppressed (KP 11.1% and GP 10.1%).This is in contrary to certain studies that found similar patterns of virological failure for people on first-line as compared to those on second-line

treatment (Hermans et al., 2017; Tanser et al., 2017). Approximately half of the study participants were on a single-tablet dosage regimen of Tenofovir+Lamuvidine+Efavirenz (TDF/3TC/EFV) and its use was significantly associated with virological suppression. The findings in this study is in tandem with other literature that highlights the benefits of patient satisfaction, adherence and VL suppression while being on first line regime. VL suppression in this study did not differ between reported current ART regime and documented ART regime or with duration of being on treatment. About 10% of the study participants were on second line regimes. Study participants who were on second line-based regime were less likely to be virally suppressed across both population type (KP 56.3% and GP 15.4%).

The study findings showed increased prevalence of TB/Pneumonia among the KP who were not virally suppressed. A nationally representative study in Kenya by Cherutich et al., (2016) observed high prevalence of TB/Pneumonia among general populations but did not stratify TB/Pneumonia by population type. To achieve the 95-95-95 UNAIDS goal, it will be prudent to integrate routine screening and management on TB Pneumonia as it complicates HIV treatment outcome.

The prevalence of STIs observed (34.8%; n=231) in the study continues to pose serious public health concerns, especially because of the complex sexual networks and bridging between KP with general populations. Having STI is an indication of unsafe sex practices of unprotected sexual intercourse, hence a pointer to high-risk sexual behaviors among these groups. Particularly, it's a concern among populations who are HIV positive and taking ART medication. Prevention with KP who are the drivers of HIV epidemic is critical in Homa Bay since this county currently leads in HIV incidence in Kenya (NASCOP, 2020b). The question that arises is persisting sexual behavior despite existing interventions.

5.4 Risk Behaviours Assessment of HIV Infected Sex Workers and GPs in Homa Bay County on Viral Load Suppression

The risk behaviours assessed were: condom use, alcohol, drug and substance use, violence and multiple sexual partners. Whereas self-reported condom use among GP was high, at 78% versus 94.1% among KP when asked about condom use in last months, this dropped considerably when condom use was stratified into consistency of condom use, with 49.1% KP and 32.4% GP reporting always using condoms. It was observed in this study, condomuse negotiationwas more

likely with casual sexual partners. High viral load was more frequent among GP participants who also did not use condoms consistently, had multiple sexual partners and, who took alcohol. Majority of those who took alcohol also frequently missed clinic appointments. The risky behaviors can also be attributed to high STI prevalence observed in the current study. Similar results were also found in a study done in South Africa that reported that 50% of people who indulge in unsafe sexual practices including unprotected vaginal or anal sex with inconsistently condom use did not obtain virological suppression (Lecher et al., 2016). This study however did not look at awareness of HIV status of the sexual partners, which therefore becomes a public concern of achieving undetectable virus is equal untransmitted virus (U=U) UNAIDS goal. Lack of condom use negotiation, GBV and alcohol is a toxic combination that aggravates risk for poor HIV prevention and control as denoted in a national representative study done in Malawi (Lancaster et al., 2015).Having multiple sexual partners like in the case of sex workers in comparison with other women of reproductive age, increases their likelihood of acquiring and transmitting HIV to sexual partners. This raises concerns about the implementation/use of preventive measures(Hermans et al., 2017). The GP 61.1% and 44.4% of the KPwho missed clinic appointments as a result of alcohol intake with a significant association being observed among the GP (P=0.009) did not suppressed. In addition, the study observed non suppression among 53.3% of the KP and 46.2% of the GP who took alcohol which concurs with a Jordan et al., (2014) urban community study that showed that there was an association of detectable virological suppression among those who took alcohol and injected drugs.

In adequate use of preventive measures may increase the risk of non-suppression among KP and GP. This is consistent with studies such as Kenya AIDS Indicator Survey (KAIS) and other Kenya Demographic Health Survey (KDHS) which might also help explain general trend on the country's STIs and new HIV infections.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary

The study demonstrates a good viral load suppression rate among the HIV positive KP as compared to GP on ART. Variables associated with viral load suppression were age, level of education, KP typology, ART regime, ART adherence, TB/Pneumonia, condom use, alcohol and drug use and gender-based violence.

6.2 Conclusion

1. Objective 1: The results show that GP and KP differ in the socio-demographic factors that mediate viral suppression. There is need to program differently based on population type for epidemic control to be achieved by 2030.
2. Objective 2: Clinical characteristics predicts viral suppression by KP and GP with ART regime switch, TB/Pneumonia and adherence should be keenly looked at in program implementation
3. Objective 3: Safe sex practises is very critical in HIV programs for all population type, only then UNAIDS of 95.95.95 can be achieved.

6.3 Recommendations

1. There is need for tailored HIV prevention programs for HIV positive populations of different age groups, education levels and population type.
2. Combination HIV prevention approach should be used to all populations to reduce HIV incidence while contributing to the 95.95.95 goal of HIV prevention.
3. Programs needs to design and implement safe sex practices HIV prevention programs tailored for different population type.

6.4 Recommendations for Future Studies

1. There is need for a country-based study to understand the KP typology to virological suppression.
2. The county reports indicate availability and distribution of condoms; however, the study records high non-usage of condoms. Further studies are therefore recommended for access and use pathway.
3. Since ART regime switch is important to HIV treatment and public health programming,

it’s important to conduct further studies on reasons for and progress after régime switch, criteria and timing for switch in relation to virological suppression.

4. Self-reported HIV characteristics and document factors should be further analysed to enhance quality programming and policy development.

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APPENDICES

APPENDIX I: CONSENT FORM

Title: Factors influencing virological suppression among HIV infected sex workers and general population in Homa Bay County, Kenya

I am Lucie Sunday Adagi, a Master of Public Health (MPH) student at Maseno University. I am carrying out research on factors influencing virological suppression among HIV infected female sex workers and general populations in three integrated facilities in Homa Bay County, Kenya. You are one of the chosen study participants. I assure you that all of your participation and responses will be treated with privacy and strict confidence. Not a record of your name or address will be kept. You are at liberty to skip any of questions you may uncomfortable to answer and you can also opt out of the interview at any time. Kindly not that there is no right or wrong answers in this research. I understand that some of the topics or questions may be uncomfortable and difficult to discuss, but note that many FSW and GPs have found them worthwhile to talk about them. Your participation is completely voluntary but your experiences could be very helpful to people who are at increased risk of HIV transmission and acquisition. Interview will take approximately 45 minutes to completion. Up to this point do you have any concerns or question? Are willing to be interviewed as participant in this study?

Signed _____ Witness: _____

Date _____ Date: _____

Thank you for accepting to be part of the study.

To be completed by interviewer

I endorse to have taken the study participant through the consenting process above.

Signed: _____

Date _____

Address for MUERC Contact person:+ 254 57 351 622 EXT. 3050

Directorate of Research, Publications and Innovations (DRPI)

Maseno University Main Campus P. O. Box, Private Bag Maseno, Kenya.

Address for County Director of Health: Dr Gordon Okomo - +254 708264863

APPENDIX II: QUESTIONNAIRE

QUESTIONNAIRE ON FACTORS INFLUENCING VIROLOGICAL SUPPRESSION AMONG HIV INFECTED SEX WORKERS AND GENERAL POPULATIONS IN HOMA BAY COUNTY KENYA

INSTRUCTIONS:

Tick (√) the appropriate response provided. Please do not write participants name on this questionnaire.

A. SOCIALDEMOGRAPHIC INFORMATION

1. Age in years: 15-19 **[ ]** 20-24 **[ ]** 25-30 **[ ]** 31-39 **[ ]** 40-49 **[ ]** Above 50**[ ]**

Date of birth: _____

2. Marital Status:

Single [ ]Married/Cohabiting [ ] Separated[ ] Widowed[ ] Divorced [ ]

3. Education: No Education[ ]Primary level [ ]Secondary level [ ] Tertiary level [ ] Does not wish Disclose [ ]

4. Population Type: KP [ ] GP [ ]

If KP, which places do you frequent and interact with your sexual partners?

5. KP Typology: Home based [ ] Street/bar based [ ] Lodging based [ ]

B: CLINICAL CHARACTERISTICS

6. Is the client on ART? Yes [ ] No [ ]

If yes, Type of regimen?.....

Regimen switch?Yes [ ] No [ ]

If yes, date of regime switch .....

Current ART regimen First line [ ] Second line [ ]

7. How long have you been on ART? (In years) .....

8. a) Have you ever missed taking your ART drugs? Yes [ ] No [ ]

b) If yes for how many days did you miss taking your drugs? ……..

c) What made you miss taking your ART drugs?

Did not remember [ ] Took alcohol [ ] Did not want my sexual partner to see the drugs [ ] Can't remember the reason [ ] Not sure [ ]

ART Adherence (%)_____ Poor [ ] Fair [ ] Good [ ]

9. Have you suffered or treated ofTB or Pneumonia in the past one year? Yes [ ]No [ ]

Probe for any cough lasting more than two weeks and/or chest pain _____

10. Have you had any of the following in the past 6 months? (Tick all that apply)

Foul smelling vaginal discharge	Yes [ ]	No [ ]
Anal discharge	Yes [ ]	No [ ]
Urethral discharge	Yes [ ]	No [ ]
Genital ulcers	Yes [ ]	No [ ]
Painless growth in vaginal area	Yes [ ]	No [ ]
Lower abdominal pain	Yes [ ]	No [ ]

C. RISK BEHEVIOUR ON VIRAL LOAD

11. a) Have you ever experienced violence because you requested for the sexual partner to use a condom or at any time with your sexual partner? Yes [ ] No [ ]

b) Have you experienced any form of violence in the last one year? Yes [ ] No [ ]

c) If yes, what form of violence? Sexual [ ] Physical [ ]

If sexually abused was a condom used? Yes [ ] No [ ]

d) Has violence in any way made you miss your clinic appointment or drugs?

Yes [ ] No [ ] Not Sure [ ] Declined response [ ]

12. a) How many sex acts do you have on average per day? ___week? ____Month? _____

b) How many sexual partners have you had in the past one year?

0[ ] 1[ ] >1[ ] b) If 1 or >1, are they

Regular [ ]

Casual [ ]

Permanent [ ]

13. Do you use protection (condoms) with your sexual partner/partners during sexual intercourse?

Yes [ ] No [ ] If no skip to 12 Sometimes [ ]

a) If yes which type of condoms do you mainly use? [ ] Male [ ] Female

b) How often do you use these condoms? [ ] Always [ ] Sometimes [ ] Never

c) Do you lubricate the condoms during sex? Yes [ ] No [ ]

d) What do you use for lubricating the condoms? [ ] KYJelly [ ] Vaseline[ ] Water [ ] Saliva [ ] Soap [ ] Other……..

e) How do you know about male and female condom? Yes [ ] No [ ]

f) How often do you negotiate for condom use with the following sexual partners?

Casual partner **Regular partner** **Permanent**

1. Sometimes [ ] 1. Sometimes [ ] 1. Sometimes [ ]

2. Always [ ] 2. Always [ ] 2. Always [ ]

3. Never [ ] 3. Never [ ]3. Never [ ]

4. Not applicable [ ] 4. Not applicable

14. a) Do you drink alcohol or use any other addictive drugs? Yes [ ] No [ ]

b) If yes: Have you ever missed your drugs while under the influence of alcohol or any other drugs?

Yes [ ] No [ ]

c) Have your ever gone for clinic appointments while under the influence of alcohol or any other drugs?

Yes [ ] No [ ]

If no, what are some of the reasons that made you not to go to the clinic?_____

D. VIROLOGICAL SUPPRESSION

13. a) Are you aware of your viral load? Yes [ ] No [ ]

b) What does it mean to your HIV prevention and control?_____

(Confirm the most current results from client records)

LDL [ ]

Low viremia level (≥50-999copies/µL/year) [ ]

High viremia level (≥1000copies/µL/year). [ ]

APPENDIX III: FGD GUIDE

Focus Group Discussion Guide

HIV- positive FSWs and general populations

Time Required:	**100 minutes**
Group discussion time:	85 minutes
Break:	15 minutes

ITEMS REQUIRED:
PAPER AND PENS
AN EASEL
MARKERS
CARDS TO BE USED FOR PARTICIPANTS NAME
TAPE/AUDIO RECORDER
A MODERATOR AND ASSISTANT

THE QUESTIONS TO BE ANSWERED IN FOCUS GROUP DISCUSSION:

Reminder to the moderator:
The aim of this group discussion among HIV infected sex workers (SWs) and general populations (GPs) in Homa Bay County is to determine the following:

- Risk perception of viral suppression among the HIV infected SWs and GPs
- Barriers to viral load suppression of undetectable levels – condom use, alcohol use and violence
- What are the barriers and obstacles to getting into HIV care and remaining in care; as well as ART adherence and promotion of sexual health in self and partners?

TO INTRODUCE [5 min]:

Good morning. My name is Lucie Sunday Achieng' Adagi, and I am a Student at Maseno University. First, allow me appreciate you all for your time.

Basically, we will discuss your thoughts and ideas about HIV Treatment, risk perception and sexual health protection, condom and alcohol use and viral load suppression. Our discussion will provide guidance needed for us to design attractive programs for local HIV positive FSWs to promote them quickly getting into HIV service when they learn that they are infected with HIV, staying in care, and using ART and getting virally suppressed

For starters, allow give an insight on what a focus group discussion is, then narrow it down on this specific one. A focus group is more like a discussion group where, people are asked to talk about their thoughts and ideas about a subject while discussing. I will introduce a subject/topic by asking a question to the group. All answers are right, none is wrong. I am looking forward to an informal discussion on how you people think or feel. Feel free to respond to any question and interject as you please sharing how you feel about the subject matter. All your opinion and responses are right and no single one is enough. My plea is for each one of us to be very open

and free for I would be glad to hear all your thoughts and feelings about each topic. The more information you provide the better for the discussion.

1. For the group to be fully involved and engaged, there are a few "ground rules" I am hopeful that we will all agree as we start. {review ground rules}
2. Ensure to protect each other's confidentiality (you are free to share anything you have heard in here but do not link it with someone who is here). I know you may know each other. Even if you do, kindly respect opinion, privacy and maintain confidentiality. All of us here are people living with HIV, hence it is very prudent to respect each other's opinion on what to share and what to not share. All information discussed remain in here do not share someone's HIV status outside this place.
3. Let us respect each other and each other's feeling and opinions. All thoughts and feelings are correct none is wrong and I will request that all of us share.
4. Lastly, kindly speak one at a time, this will help us listen to one another more easily and freely. It will also help us transcribe more accurately.
5. Don't use your names, but the number you will be given

Do you have any questions or reaction to the ground rule or even any additional thought? {Allow each participant to confirm they agree to the rules.}

The sessions will tape recorded so that we don't miss anything. Please note that what has been recorded with eventually written into notes/texts and will only be accessed and read by the study team to pick your thoughts and feelings today. The texts/notes will be de-identified, meaning that no names or any pointers to anyone here will be elicited and nothing can be linked to the group members here. Everything will be kept will strict confidence and will only be reviewed by the research team. No names or any identifiers shall be used on any reports or presentation.

Do you have any questions up to that point?
Before we start the recorded, I would wish that we start by knowing a little about each other.

PREABLE. [10 minutes]
Okay, let's begin by getting to know a little about each other.
A. Using the paper in front of you, kindly write your age, education, residence registration, and how long have you been living in Homa Bay. [GIVE TIME]
B. Ok we can now start. You can introduce yourself using your first names only, or nickname and your hobbies
C.For how long have you stayed in Homa Bay?

Great. Let's begin recording.

[TURN ON TAPE RECORDER]

BEGIN.
[**HIV RISK**] [**10 minutes**]
Q1. How do you think people in Homa Bay feel about HIV in general?
⇒PROBE: How much support have you received as a person living with HIV from the community?

How openly can you talk about HIV amongst your friends, family, the Sex Workers (if addressing sex workers) community, with health worker?

Q2. What kinds of programs or initiatives are needed in Homa Bay to better support HIV infected person living with HIV to achieve viral suppression?

Q3. If you think back to when you received your HIV test results, when did you enroll into ART treatment? Did anyone talk to you about getting into care or help you to do it?
⇒PROBE: How long did you wait to be enrolled in HIV care?

Q4. When people are dealing with being HIV what do you think are some of the main factors that make people to quickly get enrolled into HIV care? Making them virally suppressed? Retaining on ART? What things help? What things get in the way or make it much harder?

Q5. What would you recommend to HIV testing sites, the community, programs or HIV care clinics in terms of how they can best support newly diagnosed people in getting enrolled into HIV treatment?

[**HIV RISK REDUCTION INTERVENTION**] [**30 minutes**]

I would like to spend a few minutes talking about ways people protect the sexual health of themselves and their partners.

Q6. What kinds of things do you do, or have you heard about other people doing, to protect themselves and their partners from STIs and HIV? {write on flip chart}
⇒PROBE: Positioning? Condom use? Avoidance of certain partners or venues? Minimizing number of partners? Minimizing drug and alcohol use? Discussing HIV status? Use of ART and being retained on ART? Adherence to ART treatment and clinic visit

Q7. Of the things we have listed here, which would you say are the ones that are (1) easiest for you to use? (2) most commonly used by HIV positive people in your community? (3) Most effective at preventing transmission of HIV and reinfection? {write on flip chart}

Q8. Let's talk some more about condoms. How do you feel about condoms? In general, or in certain relationships or kinds of sex?
⇒PROBE: What are the major reasons why people use condoms?
⇒PROBE: What are the major reasons why people do not use condoms?
In your opinion what are the biggesthurdles to condom use?
⇒PROBE: What would make condom use more attractive?

Q9. Where do people get condoms?
⇒PROBE: If they buy, how much do condomscost?
⇒PROBE: Where do you think would be the most appropriate place to get condoms? What would make condoms easier to get?
Q10. What about risk reduction counseling around the HIV prevention has anyone engaged you in any kind of risk reduction counseling like that? What were your impressions?

⇒PROBE: What would make those kinds of discussions most attractive for HIV infected people? Where would they be offered? How long a conversation would it be? Who would it involve (you or you and a partner)? What would it emphasize (providing the same information or working with what your interests are right now?)

BREAK [5 minutes]
[HIV ART AND VIRAL LOAD] [**30 minutes**]

Q10. How often do you attend HIV care visits?

Q11. Once you were enrolled into HIV care and treatment what kinds of things made it easy or easier; and what kinds of things made you not to stay in HIV care and go for appointments in the recommended intervals?

Q12. What recommendations do you have for HIV program in terms of things they could do to make HIV treatment (ART) easier or less stressful?

Q13. When did you start taking ART, how many months or days after getting diagnosed with HIV?

Q14. If you could, would you have started ART treatment early?
⇒PROBE: What are important reasons that you start ART?
⇒PROBE: Why do you think it's important to take ART?

Q15. A number of people who givenART find difficult to take it regularly or as recommended.
⇒PROBE: What are some reasons why people may struggle with this? {write on flip chart}
⇒PROBE: What are some things that help people to take ART regularly? {write on flip chart}
⇒PROBE:Do you often take your drugs consistently? and why/why not

Q16. Thinking about the things we identified here {refer to flip chart}, are there things that you can suggest for people, clinics and programs to do to help those who are taking ART drugs take them more easily and regularly?

Q17. Would one be interested in having brief conversations with someone about ways to stick with HIV medications? Who should that person be, someone at the clinic, a peer who has been living with HIV for a while? Group or individual one on one meetings?

Q18. What do you understand about viral load? Do you know your own last VL result? and in their own perspective do you think you are virally suppressed? Why do you think it is important for an HIV infected person on ART to be virally suppressed?
⇒PROBE: What are some reasons why HIV infected people may struggle with achieving viral load suppression? {write on flip chart} (Age, KP type, marital status, alcohol and drug intake, sexual partners, gender-based violence, opportunist infections, STIs)

⇒PROBE What are some things that may help HIV infected people to be virally suppressed? {write on flip chart}
⇒PROBE What are some things/factors that may you to be virally suppressed? {write on flip chart}
⇒PROBE What are some things/practices that may you not to be virally suppressed? {write on flip chart}

Q19. Thinking about the things we identified here {refer to flip chart}, are there things that you can suggest for HIV infected person, clinics and programs to do to ensure viral load suppression?

[WIND DOWN/WRAP UP] [10 minutes]

Q20. What recommendations do you have for developing a program that tries to help HIV positive people that have not yet been discussed? Is there anything you might want to add?

[**SALUTATIONS**] I allow me take this opportunity to appreciate you all for finding time to come here. We aresincerely grateful with your responses, opinions and ideas, they have been extremely helpful.

[~1.40 hours]

APPENDIX VI: DATA ABSTRACTION FORM

DATA ABSTRACTION FORM

1. **Facility #** ___
2. **Study Pop type** ☐ KP ☐ GP
3. **Participant Study ID #** ___ ___ ___ ___
4. **Date of Birth** __ __/__ __/__ __
   day mo yr
5. **Sex** ☐ Male ☐ Female
6. **Marital Status** ☐ Single ☐ Married/Cohabiting ☐ Separated/Widowed/Divorced
7. **Education** ☐ No Education
   ☐ Primary
   ☐ Secondary
   ☐ Tertiary
8. **Clinic Last Visit Date** ___ ___/ ___ ___/___ ___
   day mo yr
9. **Reason for Visit** ☐ Scheduled ☐ Unscheduled ☐ Other_____
10. **Sexuality History** In last six months:
    What is the number of Sexual Partners _____ total [____ males?]
11. **ART Regime:**

	Yes	No
First Line	☐	☐
Second Line	☐	☐

If on second line, kindly state the reason of switch…….

12. **Adherence to ART:**

Good	☐	☐
Poor	☐	☐
MPC	☐	☐

If adherence is poor, what has been done to boost adherence?.....

13. **STI at the last visit:**

	Yes	No
Vaginal Discharge	☐	☐
Pelvic Inflammatory Disease	☐	☐
Genital Ulcer Disease	☐	☐
Urethral Discharge	☐	☐
Other	☐ _____	
None	☐	

14**. Opportunistic infection**

	Yes	No
Malaria	☐	☐
TB	☐	☐
Pneumonia	☐	☐

If Yes, date of the most current diagnosis:

15. **Viral Load levels - current:**

LDL	☐	☐
50-500	☐	☐
501-999	☐	☐
>1000	☐	☐

APPENDIX V: WORK PLAN

Activity	Responsible Individual	Time (in months)											
		1	2	3	4	5	6	7	8	9	10	11	12
Writing Research Proposal	Student												
Revising and Finalizing Proposal	Student Supervisors												
Ethical Approval	MUERC												
Recruitment and Training research assistants	Student												
Pilot Study	Student R. Assistants												
Revision of Data Tools and Instruments	Student R. Assistants												
Data Collection	Student R. Assistants												
Data Checks and Cleaning	Student R. Assistants												
Preliminary Data Analysis	Student												
Data Analysis and Interpretation	Student Statistician												
Thesis Writing including discussion and results	Student Supervisors												
Submit Thesis	Student												

APPENDIX VI: RESEARCH BUDGET

No	ITEMS	QUANTITY REQUIRED	UNIT COST (Kshs)	TOTAL COST (Kshs)
	STATIONARY and SUPPLIES			
1	Printing papers	7 reams	550	3,850
2	Ball points	2 packets	10	120
3	Pencils	10	20	200
4	Erasers	10	10	40
5	Flash disk	2	2500	5,000
6	Note books	10	50	500
7	Pocket files	10	30	300
8	Stapler	1	600	600
9	Staples	2packets	300	600
	PROPOSAL DEVELOPMENT			
10	Draft proposal printing	4 copies	1000	4,000
11	Printing of final proposal	5 copies	1000	5,000
12	Research proposal binding	5 copies	300	1,500
	ETHICS APPROVALS			
13	Payment of the Ethics review	3 places	2000	6000
	FIELD WORK			
14	Printing of the study instruments	700	10	7000
15	Pre-test of study instruments	70	10	700
16	3 Research assistants	21 days	1000	63000
17	FGD collection and transcription	10 days		30000
	THESIS			
18	Thesis Printing	9 copies	1000	9,000
19	Thesis Binding	7 copies	1000	3,500
	COMMUNICATION			
20	Statistician Consultancy	-	-	30,000
21	Dissemination	-	-	20,000
19	Contingency (10%)	-	-	19,090
	TOTAL			210,000

APPENDIX VII: MASENO ETHICS APPROVAL

MASENO UNIVERSITY ETHICS REVIEW COMMITTEE

Tel: +254 057 351 622 Ext: 3060
Fax: +254 057 351 221
Private Bag – 40105, Maseno, Kenya
Email: muerc-secretariate@maseno.ac.ke

FROM: Secretary - MUERC

DATE: 4th July, 2019

TO: Lucie Sunday Achieng Adagi
PG/MPH/PH/00049/2017
Department of Public Health
School of Public Health and Community Development
Maseno University
P. O. Box, Private Bag, Maseno, Kenya

REF:MSU/DRPI/MUERC/00731/19

RE: Factors Influencing Virological Suppression among HIV Infected Sex Workers and General Populations in Homabay County, Kenya. Proposal Reference Number MSU/DRPI/MUERC/00731/19

This is to inform you that the Maseno University Ethics Review Committee (MUERC) determined that the ethics issues raised at the initial review were adequately addressed in the revised proposal. Consequently, the study is granted approval for implementation effective this 4th day of July, 2019 for a period of one (1) year. This is subject to getting approvals from NACOSTI and other relevant authorities.

Please note that authorization to conduct this study will automatically expire on 3rd July, 2020. If you plan to continue with the study beyond this date, please submit an application for continuation approval to the MUERC Secretariat by 15th June, 2020.

Approval for continuation of the study will be subject to successful submission of an annual progress report that is to reach the MUERC Secretariat by 15th June, 2020.

Please note that any unanticipated problems resulting from the conduct of this study must be reported to MUERC. You are required to submit any proposed changes to this study to MUERC for review and approval prior to initiation. Please advice MUERC when the study is completed or discontinued.

Thank you.

Dr. Bernard Guyah
Ag. Secretary,
Maseno University Ethics Review Committee.

Cc: Chairman,
Maseno University Ethics Review Committee.

APPENDIX VIII: NACOSTI APPROVAL

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Ref No : 830399

Date of Issue: 21/August/2019

RESEARCH LICENSE

This is to Certify that Ms., Lewo Adagala Mapesa, University, has been licensed to conduct research in the area of the topic: FACTORS INFLUENCING VIROLOGICAL SUPPRESSION AMONG HIV INFECTED SEX WORKERS AND GENERAL POPULATIONS for the period ending : 21/August/2020.

License No: NACOSTI/P/19/913

830399

Applicant Identification Number

Director General

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

APPENDIX IX: HOMABAY COUNTY APPROVAL

MINISTRY OF HEALTH

Telegrams: "MOH" Homa Bay
Telephone: 21039
When replying please quote
homabaychc@gmail.com

MINISTRY OF HEALTH
HOMA BAY COUNTY
P.O. BOX 52
HOMA-BAY.

Ref: MOH/HB/CTY/RA/VOL.11/185

15th July 2019

Lucie Sunday Achieng Adagi
PG/MPH/PH/00049/2017
Department of Public Health
School of Public Health and Community Development Maseno University
P O Box, Private Bag, Maseno Kenya

RE: AUTHORITY TO COLLECT DATA

This is to inform you that permission to collect data on your research proposal entitled "***FACTORS INFLUENCING VIROLOGICAL SUPPRESSION AMONG HIV INFECTED SEX WORKERS AND GENERAL POPULATIONS***", in Homabay County, has been granted for the period ending June 2020.

You will be required to adhere to the hospital's norms and regulations, and involve both the County Health Management Team and hospital's staff during the research period, and we expect to get communication on your findings at the hospital level and by the undersigned at the end of the research period.

Wish you all the best in your research.

MINISTRY OF HEALTH
DIRECTOR OF MEDICAL SERVICES
15 JUL 2019
Sign.....
P.O. Box 52-40300 HOMA-BAY

Dr. Gordon Okomo
Director of Health
HOMABAY COUNTY

APPENDIX X: PROPOSAL APPROVAL LETTER

MASENO UNIVERSITY
SCHOOL OF GRADUATE STUDIES
Office of the Dean

Our Ref: PHT/MPH/00049/2017

Private Bag, MASENO, KENYA
Tel:(057)351 22/351008/351011
FAX: 254-057-351153/351221
mail: sgs@maseno.ac.ke

Date: 26th April, 2019

TO WHOM IT MAY CONCERN

RE: PROPOSAL APPROVAL FOR ADAGI SUNDAY LUCIE ACHIENG — PHT/MPH/00049/2017

The above named is registered in the Masters of Public Health Programme in the School of Public Health and Community Development, Maseno University. This is to confirm that her research proposal titled "Factors Influencing Virological Suppression among HIV Infected Sex Workers and General Population in Homa-Bay County, Kenya." has been approved for conduct of research subject to obtaining all other permissions/clearances that may be required beforehand.

Prof. J.O. Agure
Maseno University

SCHOOL OF GRADUATE STUDIES * MASENO UNIVERSITY * 26 APR 2019 * P.O. BOX PRIVATE BAG, MASENO *

ISO 9001:2008 Certified