An Examination of the Influence of Social Network Characteristics on Access to HIV Preventive and Curative Services among Female Sex Workers in Nairobi

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other university. This thesis contains no material previously published or written by another person except where due reference is made in the proposal itself.

Signature…… Date……06/04/2025……

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This thesis has been submitted for examination with my approval as a University Supervisor.

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LIST OF ABBREVIATIONS

AIDS – Acquired Immunodeficiency Syndrome

ART – Antiretroviral Therapy

FSW – Female Sex Worker

HIV – Human Immunodeficiency Virus

HTC – HIV Testing and Counseling

HTS – HIV Testing Services

KENPHIA – Kenya Population-Based HIV Impact Assessment

KPSE – Key Population Size Estimate

MSM- Men who have Sex with Men

NASCOP – National AIDS and STI Control Programme

PITC – Provider Initiated Counseling and Testing

PNS – Partner Notification Services

PrEP – Pre-Exposure Prophylaxis

PWID – People Who Inject Drugs

SNS- Social Network Strategy

STI – Sexually Transmitted Infections

DEFINITION OF TERMS

Drop-In Centers: These premises provide key population community members with comfortable places to get information, receive program services, and interact with each other and the HIV prevention program staff.

Key Population: These are groups that, because of specific high-risk behaviors, are at an increased risk of acquiring Human Immunodeficiency Virus (HIV). They also have legal and social issues that increase their vulnerability to the infection. They include sex workers, men who have sex with men (MSM), transgender and people who inject drugs (Ministry Of Health, National AIDS and STI Control Program, 2014).

Social Network: A group of individuals linked by a common set of relationships or behaviors that includes sexual & drug-injecting partners and social contacts.

Social network-based HIV testing approaches (Social Network Strategy for HTS): It is an extension of HIV partner services, the provider asks people with HIV or those that are HIV-negative and at ongoing risk of acquiring HIV to encourage and invite individuals in their sexual, drug-injecting, or social networks to participate in voluntary HTS.

Peer Educator: This is a trained individual who makes a deliberate effort to motivate his/her peers to gain knowledge, skills and to change their attitudes, beliefs, and behaviors toward desired change.

High-risk Negative. An individual who tests HIV negative but was assessed using a standard risk assessment tool as a person who is at high risk of acquiring HIV due to specific risky behaviors.

New HIV Positive: An individual who had never been tested or had a previous negative HIV test but has tested HIV positive for the first time.

Seed/Recruiter: An individual who refers their social contacts for testing after a coaching process from the health care provider on how to approach the networks and initiate the conversation on HIV testing. The seeds are categorized into three, Peer Educator, High-risk Negative or Newly diagnosed HIV Positive

Secondary Seed: A social contact who has been referred for HIV testing and who also agrees to refer her/his networks for the same service.

ABSTRACT

Achieving universal health coverage is long-term, and political and technical knowledge is needed for this to happen. Even with the availability of Human Immunodeficiency Virus (HIV) services, Female Sex Workers (FSW) find it hard to access these services. The study examined the utilization of social networks to improve health services access among female sex workers. It explored how the type of relationship between a peer educator and the peer, and that of a peer-to-peer, influences the acceptability of services. This retrospective cohort study thus analyzed routine program data at 10 Drop-In Centres and one integrated public health facility. All seeds/recruiters participating in the intervention between October 2021 and September 2022 were included in the study. That is 17 peer educators and 1,153 peers (867 high-risk HIV negative and 286 HIV positive) who referred 3,498 social network members for HIV services. A data extraction form was used to collect information from the Social Network Strategy Register, HIV Testing and Counseling, Laboratory Register for verification of results and Kenya EMR (Electronic Medical Records) to verify linkage to PrEP (Pre-Exposure Prophylaxis) and ART (Antiretroviral Therapy) and subsequent continuation. A descriptive analysis was done presenting percentages, frequencies, and mean. The chi-square test and odds ratio were used for categorical data, presenting the p-values and rate ratios. The mean age of the seed was 33 years. Out of the 3,498 social network members referred for services, 5% (180) were newly diagnosed with HIV of whom 178 were linked to ART (99% linkage). Of the 3318 HIV Negative social network members 64.4 % (2127) were linked to PrEP. An association between age group and linkage to PrEP was established at a p-value of 0.037, with the less than 20 years linkage of social network members to PrEP having the highest proportion. In addition, there was an association between the type of relationship between the seed and social network member and linkage to PrEP with a p-value of <0.01. Compared to the peer-educator-to-peer cohort, the peer-to-peer cohort had 0.388 times greater odds of linking their social network member to PrEP. An association between the type of relationship and HIV case identification was established at a p-value of <0.01. The peer educator's cohort had 3 times greater odds of identifying a positive to the peer-peer cohort. The social network influence at play for the peer-to-peer cohort is based on the similarities between the peers and the strength of their relationship. On the other hand, the mechanism of influence between peer educators and peers is based on the leadership role they play and their credibility among their peers Understanding how female sex workers overcome obstacles to accessing healthcare services is important in coming up with practical strategies that would support their participation in their care and monitoring the effectiveness of the national HIV response.

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter introduces the background of the study topic. It showcases the inequitable efforts in increasing coverage for HIV health services among female sex workers. It outlines the problem statement, research objectives, research questions, scope, and the significance of the study.

The study examines the use of the social network approach (Social Network Strategy for HIV Testing Services) as a participatory intervention among female sex workers in addressing healthcare access. It seeks to explore the mechanism of social influence on behavior change regarding the acceptability of healthcare services among female sex workers

1.1 Background

Achieving the 2030 Sustainable Development Goals requires Universal Health Coverage (UHC) (Socías et al., 2016). Health access is a fundamental human right, and UHC is essential for both individual and population health outcomes (Socías et al., 2016). Realized need, or the timely utilization of services per need is the definition of access (Peters et al., 2008). The idea of access to health is complex and arises from the interaction of social and physical settings in which people live and work, aspects of the health system, and macro-structural elements like laws and policies (Socías et al., 2016). Health system factors include service accessibility (distance/transportation). Availability (waiting times) and acceptability(language and cultural barriers, enacted and perceived stigma) (Socías et al., 2016).

Two options can be employed to improve access to health services for poor and vulnerable patients. The first is the capacity building of healthcare providers to target service provision to selected groups. This is a supply-side strategy. The second is to reduce barriers to access and participation. This is a demand-side strategy(Jacobs et al., 2012). The study focused

on the demand-side strategy, examining the utilization of social networks to improve health services access among female sex workers.

Access to healthcare among female sex workers, has been hampered by discrimination by healthcare staff, police harassment, and gender-based violence (Jin et al., 2021). Discrimination and stigma are consistently associated with poor mental health. Like in other sub-Saharan African nations, sex workers in Kenya are a highly marginalized group who experience stigma associated with their work because of their perceived HIV status and criminalization (Ma et al., 2020). The stigma surrounding sex work and HIV increases the susceptibility of female sex workers to HIV (Ruegsegger et al., 2021). Stigma is frequently linked to lower healthcare engagement and worse health outcomes (Ma et al., 2020).

Due to many variables, including societal stigma, discrimination, limited access to healthcare, and risky behaviors, female sex workers are more likely to contract HIV (Kigombola et al., 2023). Poor health outcomes and lower healthcare involvement have been repeatedly linked to stigma (Ma et al., 2020). Clients' stigmatizing views of sex workers may be dehumanizing, thus hindering their ability to bargain for the usage of condoms (Ruegsegger et al., 2021). There is consistent evidence linking stigma to poor mental health (Ma et al., 2020). In Sub-Saharan Africa, the practice of sex work is stigmatized and considered a crime. Both actual and perceived stigma arise from this. This leads to a phobia of getting medical attention for fear of having their sexual habits discovered (H.-Y. Kim et al., 2018). Stigma and discrimination are associated with undesirable coping mechanisms, which include alcohol and drug abuse(Ruegsegger et al., 2021). Use of drugs before sexual activity is linked to decreased condom use (Chersich et al., 2014). The stigma surrounding sex work and HIV increase the susceptibility of female sex workers to HIV (Ruegsegger et al., 2021)

One important takeaway from the four decades of the HIV epidemic is that people are driven underground by restrictive and stigmatizing policies (Iversen et al., 2020). It perpetuates stigma and erodes trust and respect for human rights. Therefore, disproportionately impacts vulnerable populations. Trust and respect for human rights are recognized as the cornerstones of an effective HIV response (Iversen et al., 2020).

The global median HIV prevalence among sex workers is 3.0% against 0.8% global prevalence in the total adult population aged 15-49 years(UNAIDS, 2024). In Eastern and Southern Africa the estimated prevalence is 5.7% among the adult population aged 15-49 years, this is against an estimated median prevalence of 29.9% among sex workers(UNAIDS, 2024).

Insufficient data exists regarding the prevalence of HIV among Kenyan female sex workers. This is because the last Integrated Biological and Behavioral Survey (IBBS) was conducted between 2010-2011. However, it is currently underway, taking place in 2024. This was part of Kenya Country Operational Plan 2022, Strategic Direction (Kenya-County Operational Plan, 2022.). It is expected to illustrate the current prevalence and incidence rates.

The lack of current bio-behavioral survey data and imprecise size projections are among the issues facing national programming (Musyoki et al., 2021). This reflects the global picture. Of the 137 nations that have ever released sex worker size estimates, 27 recently (within the last five years) published national empirically derived estimates that may be applied to current programming, according to the Joint United Nations Program on HIV/AIDS (UNAIDS, 2024).

The general population's HIV-related health outcomes have significantly improved (Jin et al., 2021). However female sex workers have not equitably benefitted from efforts in increasing coverage (Jin et al., 2021). An essential component of this fight is HIV status awareness and treatment.

Effective service coverage for all groups is a significant challenge in the context of Universal Health Coverage (UHC). This is particularly true for key populations such as female sex workers, who often face barriers in accessing HIV preventive and curative services. While well-intentioned, the current testing and diagnosis models have their shortcomings since they are primarily based on individual-level testing and diagnosis. While this model has been successful in many settings, it has its limitations, particularly in reaching key groups for testing and treatment. This can lead to delayed diagnosis and treatment, which can have severe consequences for both the individual and the community.

Social network targeting might be especially helpful in situations when broadcast interventions are not practicable due to a lack of infrastructure or resources (D. A. Kim et al., 2015). Social network interventions particularly employ or modify social network features to create, promote, or sustain health behaviours (Hunter et al., 2019). Network theorists examine both the characteristics of the individual as well as the interactions that limit their options or present chances for success to explain individual achievement(Borgatti & Ofem, 2010).

Evidence from empirical research shows that the relational context in which people live explains a large number of psychosocial events that influence individual behaviour (Ramos-Vidal, 2022).

An individual's health, health behaviour, and capacity to modify health behaviour is greatly influenced by his/her social networks(Hunter et al., 2019). Interpersonal relationships can disseminate knowledge and behaviour. The networks created by these relationships often intensify this spread, modifications in one person's behaviour can ripple through a social network, resulting in behavioural changes in other members of the general population (D. A. Kim et al., 2015) .

Social network testing is an alternative approach to HIV testing and diagnosis that involves leveraging social networks to identify and test individuals who may be at risk of HIV infection. In this approach, individuals are tested, and their social networks are mapped to identify other individuals who may be at risk(Kimbrough et al., 2009). This approach has been successful in reaching key populations such as female sex workers, who often have strong social networks that can be leveraged for HIV testing and diagnosis (WHO, 2019)

Age, relationship strength and peer position similarity, and social rank within the social network structure are the three ways the study evaluates the relational context.

The youth exhibit striking similarities in their attitudes and behaviours' to those of their friends (Brechwald & Prinstein, 2011). The inclination of people to interact with other subjects that they believe share traits is known as homophily(Ramos-Vidal, 2022). According to social homophily theory, young people are more likely to initially associate

with peers who share their interests and viewpoints, and their behaviour and attitudes also tend to converge over time (Brechwald & Prinstein, 2011).

The mechanism of social network influence includes; structural equivalence, network-weighted exposures, and network thresholds (Valente & Pitts, 2017).

When people accept innovations because they observe others who are similar to them doing the same, this is known as structural equivalence (Valente & Pitts, 2017). Regarding the study, the peer-to-peer (high-risk HIV-negative and newly diagnosed positive and their social networks) engagement is at an equal level in comparison to a peer educator who has an elevated status given their role in the social network structure.

Opinion leaders may be more adept than other people at spreading innovation within their society, according to the theory put out by network-weighted exposures (Valente & Pitts, 2017). In the case of the study, the peer educator has an elevated social standing and is exposed to new information on health. The peers have a say on who takes up the role of the peer educator. However, the influence of the peer educator to the network members may decay over time. This is in comparison to peer-to-peer influence since their interactions are likely to be more frequent.

Network thresholds refer to the number or proportion of individuals inside a network who must adopt a behaviour before that individual is willing to do so. Individuals with low thresholds adopt behaviours' much ahead of their peers (Valente & Pitts, 2017).

In light of peer age and the nature of ties among peers in social networks, the study aimed to provide information on HIV case identification rates, linkage to prevention or treatment, and treatment continuity.

HIV social network interventions are essential at a time when worldwide funding is declining for the same (Doan et al., 2022). Because these interventions take into account the effects of social and environmental factors on behavioral changes, they may be more affordable and long-lasting than individual-based interventions (Doan et al., 2022).

1.2 Problem Statement

HIV accounts for 29% of annual deaths and 15% of Kenya's disease burden. This translates to one in three adult deaths, one in five maternal deaths, and one in seven child deaths (National Syndemic Diseases Control Council, 2018). This emphasizes the need for incorporating HIV prevention and treatment services into Universal Health Coverage core benefits packages.

Political commitment is essential for not only delivering services but also combating inequality, lowering stigma and discrimination, and interacting with the most marginalized or vulnerable communities, both nationally and internationally(Carter et al., 2024). However, for marginalized populations that are disproportionately impacted by new HIV infections, political commitment alone is insufficient to mobilize resources (Carter et al., 2024).

The Kenyan government had committed to achieving Universal Health Coverage by 2022 (National Syndemic Diseases Control Council, 2018).. Annually, the HIV response costs around Kenya shillings 86.37 billion, of which more than half is spent on antiretroviral medication. International aid accounts for 63% of HIV spending, government budgets for 17%, and household contributions for 10% (National Syndemic Diseases Control Council, 2018).

Globally, just 0.6% of HIV funding was devoted to sex worker preventative intervention programming among the 53 countries that reported to the Joint United Nations Program on HIV/AIDS (UNAIDS)(UNAIDS, 2024).

It is expected that investments made specifically for female sex workers will greatly increase the cost-effectiveness of HIV response. This is mostly because of the possible multiplier effect of infections within this community, as the National AIDS and STI

Control Program of the Ministry of Health noted in 2014 guidelines (NASCOP, 2014). Using resources strategically entails focusing investments and activities in areas that will have the most effects (UNAIDS, 2023).

HIV epidemiology, access, and utilization of HIV services among female sex workers are not well understood in Sub-Saharan Africa (Moyo & Macherera, 2021). For an effective response to sex work to be implemented, there is a lack of political will, requisite funds, and attention (Richter & Buthelezi, 2021). The World Health Organization claims that the lack of priority given to this community in HIV programs is due in part to social and legal limitations (WHO, 2024). Encouraging sex workers to participate, engage, and be empowered is essential for the worldwide response to HIV to move toward universal access (Beyrer et al., 2015). To attain HIV epidemiological control, there should be a greater emphasis on getting female sex workers involved in HIV care and treatment (Moyo & Macherera, 2021).

Even though HIV Testing and Counseling (HTC) is crucial for controlling HIV, female sex workers (FSWs) in Sub-Saharan Africa still have inadequate access to HTC services. And little is known about the factors that affect FSWs' access to HTC (Nnko et al., 2019). An analysis of the lessons learned from HIV programming with the underprivileged and marginalized key populations in Kenya revealed that 46% of FSWs living with HIV were aware of their status, of whom 73% were on antiretroviral therapy (ART), and 79% of those on ART had suppressed the virus (Musyoki et al., 2021). This was significantly less than the care continuum targets accomplishments for the general Kenyan population, which is 96% of those identified as HIV positive on ART and 91% of those on ART having suppressed the virus, with 80% of the population knowing their status (Musyoki et al., 2021). Additionally, HIV case-finding rates stayed low, ranging from 1% to 1.5%, possibly because the program did not target all high-risk subpopulations (Musyoki et al., 2021).

Real-world interventions that use social networks are less common. This is despite social networks having been studied since the 1930s, public health initiatives have not frequently taken them into account (Hunter et al., 2019).

Global literature on social network interventions for HIV reveals geographically uneven publications on the subject. Low-budget, high-income nations contribute

disproportionately to the literature (Doan et al., 2022). Social network interventions should be scaled up in developing countries as they approach epidemic control, conscious of regional context.

Social Network Strategy as an intervention for HTS (HIV Testing Services) was introduced in 2019 in Kenya for key populations through the Key Population Improvement Funds. It has so far been scaled up to include men, adolescents, and young persons as per the 2022 National HIV Testing Guidelines (Kenya HTS Manual, 2022).

The Social Network Strategy for HIV Testing Services is one innovative approach that has shown excellent efficacy in detecting undetected HIV infections among important populations (Girault et al., 2015). New HIV-positive cases can be found using social network strategies at rates of at least 5% (Stojanovski et al., 2021). The World Health Organization (WHO) which acknowledges the need for focused testing methods, advises using social network-based testing, especially for key populations. It has been demonstrated that this strategy improves test acceptability, boosts HIV diagnoses, and facilitates the identification of people living with HIV (WHO, 2023).

Behavioral change interventions rely on the behaviors and cultures of target populations and must therefore be contextualized to obtain the highest effectiveness(Doan et al., 2022). Additionally, more data must be gathered about how networks both influence and are influenced by behavior to articulate the context and circumstances in which these effects take place (Valente & Pitts, 2017).

The study attempted to address this by examining the social networks recruited accessing services at various points in time. It assessed the acceptability of services and subsequent follow-up in the prevention and treatment program. Given the local context, the study anticipated adding to the body of information already in existence because behavioral change interventions need to be tailored to the customs and behaviors of the target groups (Doan et al., 2022).

1.3 General Objective of the Study

To examine the influence of social network characteristics on the uptake of HIV prevention and curative services among female sex workers in Nairobi.

1.3.1 Specific Objectives

i. To determine the social demographic characteristics of seed (recruiter) and the social network contact/member participating in the social network strategy
ii. To establish the influence of the nature of the relationship between the seed and the social network member on HIV case identification
iii. To determine the influence of the type of relationship between the seed and the social network member on subsequent uptake of either PrEP or ART

1.3.2 Research Questions

i. What are the social demographic characteristics of seeds and social network members participating in the social network strategy?
ii. What is the influence of the nature of the relationship between the seed (recruiter) and the social network contact/member on HIV case identification?
iii. What is the influence of the type of relationship between the seed and the social network member on subsequent uptake of PrEP or ART?

1.4 The Scope of the Study

This study was carried out in all Drop-in Centres and public facilities providing services to female sex workers in Nairobi County. That is 11 Drop-in Centres and 1 integrated public health facility. A chart abstraction tool using ODK software, a mobile open-source data collection platform was used to collect information on all female sex workers who participated in the social network strategy for HTS in the fiscal year between October 2021 to September 2022.

1.5 Significance of the study

The shift from cognitive or individual elements to social factors that influence behavior change presents opportunities for theory building that center on including several levels of behavior-influencing factors considering the interplay between factors at different levels (Valente & Pitts, 2017). Three issues still face public health: a) comprehending the mechanism of change; b) maintaining change when funding is cut off or programs are

terminated; and c) expanding interventions to have a greater effect (Valente & Pitts, 2017). This study focused on estimating network influences and articulating appropriate theoretical mechanisms through which the networks have effects. This is through structural equivalence and network-weighted exposure. In structural equivalence, the peers are engaging at an equal level, whereas for network-weighted exposure regarding the peer educator, the influence is through the elevated social standing given to that role.

Member nations of the World Health Organization embraced the concept of universal coverage as early as 2005 (Jacobs et al., 2012). However, low-income countries continue to face difficulties in accomplishing this goal (Jacobs et al., 2012). This is due to various barriers that impede access to needed health services (Jacobs et al., 2012). The barriers include; geographical access, affordability, availability, and acceptability (Jacobs et al., 2012). A combination of interventions is required to address specific access barriers(Jacobs et al., 2012). This is while focusing on both demand-side and supply-side barriers simultaneously (Jacobs et al., 2012). The study focused on addressing demand-side barriers. This is through directly engaging the female sex workers to increase demand for health services through referral of social networks.

The following are part of the expedited strategy to eliminate HIV as a public health issue by 2030: a) utilizing a rights-based strategy to reach recipients b) concentrating efforts on programs in areas and among populations where the most effects will be realized (UNAIDS, 2023). Changing from mass testing to testing the most afflicted group is one of the fast-track approaches for reaching the first 95, aiming at 95% of the population aware of their HIV status (UNAIDS, 2023). This will ensure that the limited resources are put where there is the most yield.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviews the literature on the study topic. The chapter begins by outlining the global, regional, and national HIV (human immunodeficiency virus) care cascade. The HIV care cascade model traces the path of people living with HIV (PLWH) from diagnosis to attaining and sustaining viral suppression through treatment and care, identifying phases and possible "leaks" in the system.). It further delves into the theoretical background and the concepts that guide the research study. It then describes the social network approach that is being studied. That is the social network strategy for HIV Testing Services (HTS), review of previous studies informed by research objectives and knowledge gaps identified. Finally, it presents a summary of the gaps identified from the other studies, operational variables, and an outline of the conceptual framework of the study.

Global overview of HIV Cascade

Eighty-six percent of the 39.9 million individuals living with HIV as of December 2023 knew they were infected. 1.3 million became newly infected with HIV that year. There were 630,000 HIV related deaths reported. Of the 39.9 million people living with HIV, 30.7 million (77%) had access to antiretroviral therapy of whom 93% had successfully suppressed the virus (UNAIDS, 2024).

Regional HIVCare Cascade – Eastern and Southern Africa

Ninety-three percent of the 20.8 million people living with HIV in Eastern and Southern Africa were aware of their HIV status in December 2023(UNAIDS, 2024). There were 450,000 new infections that year, with 260,000 deaths reported (UNAIDS, 2024). Of the 20.8 million people living with HIV, 83% had access to antiretroviral therapy, of whom 78% had suppressed the virus (UNAIDS, 2024).

National HIV Care Cascade

The National Syndemic Diseases Control Council (NSDCC) estimates that 1,378,457 million persons, or 3.31% of the population, were HIV positive in 2024. Ninety-five percent of people living with HIV knew their status . Ninety-seven percent had access to antiretroviral therapy, of whom 94% had suppressed the virus. The number of deaths related to HIV in the year was 20,480. New HIV infections reports was 16,752 (National Syndemic Diseases Control Council, 2024).

HIV Care Cascade among Female Sex Workers in Kenya

Learnings from HIV programming with underserved and marginalized key populations indicated that; 46% of Kenyan female sex workers with HIV were aware of their status, of whom 73% were on antiretroviral therapy, and 79% had suppressed the virus (Musyoki et al., 2021). These numbers demonstrated the critical need for targeted interventions to reach the female sex workers who are still unaware of their HIV status.

Insufficient data exists regarding the prevalence of HIV among Kenyan female sex workers. This is because the last Integrated Biological and Behavioral Survey (IBBS) was conducted between 2010-2011. However, it is currently underway, taking place in 2024. This was part of Kenya Country Operational Plan 2022, Strategic Direction (Kenya-County Operational Plan, 2022.). It is expected to illustrate the current prevalence and incidence rates.

A 2010 survey found that the prevalence of HIV among female sex workers is high at 29% (Bhattacharjee et al., 2015). Occupational hazards including, multiple sexual partners, condomless sex, untreated sexually transmitted infections associated with sex work are associated with high prevalence among female sex workers in Africa (Jin et al., 2021). This is in addition to the legal frameworks on sex work. Hence the focus among the key population, sex workers being part of this population. (UNAIDS, 2023). It has been demonstrated that HIV prevention programs among target populations can prevent adult infections (NASCOP, 2014.)

HIV disproportionately affects sex workers(UNAIDS, 2024). Due to social rejection, poverty, and low education level, female sex workers are a marginalized and severely stigmatized segment in society(Wahed et al., 2017).

The general population's HIV-related health outcomes have significantly improved as a result of Africa's expansion of HIV prevention and treatment programs; however, FSW have not equally benefited from these initiatives(Jin et al., 2021)

The goal of universal health coverage (UHC) and the crucial ethical premise of "equal access to health care based on equal need, free at the point of delivery" are currently receiving more attention(Wahed et al., 2017).

Gender-based violence, police harassment, and discrimination from healthcare providers have all been reported by FSW who have sought HIV prevention and treatment programs, which prevents FSW from getting the care they need(Jin et al., 2021).

To provide preventative programs for sex workers and to facilitate connections to treatment for sex workers with HIV, peer-led interventions have to be given top priority.

2.2 Theoretical Review

This part of the chapter looks at the theoretical foundation of the study, examining the different concepts under this theory.

2.2.1 Social Network Theory

Social network theory, which studies how ties and interactions within social groups impact behaviour and information flow, serves as the foundation for Social Network Strategies for HIV testing services (HTS), also known as Social Network Strategies (SNS).

A social network is defined as a collection of nodes, or actors, and the ties of a “specified type” that bind them together. Nodes that are not directly linked themselves are linked by the ties through shared points. (Newsquare, 2019). Numerous connections exist, including friendships between people, departmental communication patterns, organizational alliances, departmental exchanges, departmental alliances, and industry exchanges

(Borgatti & Ofem, 2010). The relationships between actors (individuals or firms) are the main focus of social network theory and perspective(Borgatti & Ofem, 2010). This is not the attribute-based methodology of conventional social science. The latter suggests that an individual's performance is determined by their characteristics. That is, a person's human capital which includes their degree of education, social class, and appearance is what determines how successful they are in life (Borgatti & Ofem, 2010). An organization's unique resource advantages such as the greatest personnel, technology, organizational structure, or mission are what determine its success. Conversely, the network view places a great deal of emphasis on the environment that an individual or organization lives in, which is made up of other entities and connections that exist between them (Borgatti & Ofem, 2010). Network theorists examine both the characteristics of the individual as well as the interactions that limit their options or present chances for success to explain individual achievement(Borgatti & Ofem, 2010).

The study of network effects has been categorized by three fundamental network concepts: structural equivalency, cohesiveness, and centrality(Liu et al., 2017). Three measures; degree, closeness, and betweenness indicate centrality, according to Freeman (1979)(Liu et al., 2017) The level of connectedness among a set of nodes is measured by network cohesiveness(Liu et al., 2017). One structural element that balances the power of interpersonal network is cohesiveness (Liu et al., 2017). A longitudinal study by Friedkins (1993) showed that personal influence grows stronger with more cohesive social networks(Liu et al., 2017).

When two or more points in the network have connections with the remainder of the network that are similar, they are said to be structurally equivalent (Liu et al., 2017). People in structurally equal positions frequently share characteristics, such as social status and networks (Liu et al., 2017). Equivalent nodes are likely to get similar information and social impact since they are connected to similar actors (Liu et al., 2017). It has been shown that structural equivalency predicts behavioral adoption more accurately than cohesive influence (Liu et al., 2017). Regarding the study, the peer-to-peer influence (high-risk negative and newly diagnosed positive to their social networks) showcases a level of structural equivalence, unlike the relationship between the peer educator and the peer. The

social network members are likely to listen to their peers because of their similarities. Burt (1999) suggested that two distinct network mechanisms were at work: a two-step flow process in which opinion leaders disseminated information to a group, and a contagion process via structural equivalence that led to the adoption of behaviors within the group (He et al., 2020; Liu et al., 2017). Information from the peer educator on the other hand is considered credible given their position and status in the social structure.

2.2.2 Key Concepts

Strength of Weak Ties: Weaker-than-strong relationships allow individuals to get novel knowledge. While acquaintances know people in different circles and have more unique information, close friends travel within the same circles and so acquire information that overlaps (Granovetter, 2005). Mark Granovetter, "advanced the idea that individuals are more likely to get ahead through a network of loose connections, or weak ties than through a network of strong ties"(Chamlee-Wright & Myers, 2008). Individuals with strong ties within a network are exposed to the same kind of information, weak ties allow for the inflow of new and fresh information within networks. In the case of the study, the peer educator is expected to relay new information to the social network members. She is in touch with several groups of networks. A social network member in contact with a peer educator relays the same information back to her network members.

Social Network Diagram – Strength of Weak Ties

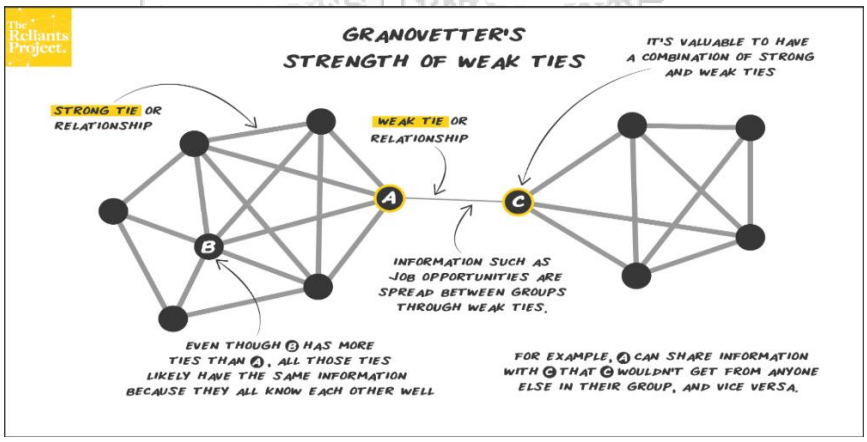


Figure 1: Social Network Diagram- Strength of Weak Ties (Kurt & Kurt, 2020).

When it comes to the phases of transformation, a social network is crucial, and its significance only increases as individuals move from awareness or pre-contemplation to

the final stages. Individuals acquire knowledge, reflect, experiment, and ultimately embrace novel behaviors within the framework of their social connections (Valente & Pitts, 2017).

Social network theory has been used to analyze a variety of health-related topics, including bullying, obesity and physical activity, teenage risk-taking physician behavior, and community-based participatory research: community coalitions, policy diffusion, and inter-organizational interactions (Valente & Pitts, 2017). Four major topics were found in an analysis of network applications in public health, which indicate potential for further development in the same field. These include a) the use of network theory and methodologies for intervention design and assessment, b) the estimation of network influences or contagion effects, c) the clarification of relevant theoretical mechanisms by which networks have effects and d) the separation of mediated vs non-mediated processes (Valente & Pitts, 2017). This study will focus on the first two challenges estimating network influences and articulating appropriate theoretical mechanisms through which the networks have effects.

Network Influence: A lot of research has gone into figuring out how social networks affect people's health-related behaviors. Focusing on short-term behavior change, the studies have been cross-sectional and associational (Valente & Pitts, 2017). Peer influence and the function of opinion leaders fluctuate since they may not be regarded as leaders by everyone, but external influence and selection, which are significant early on, fade over time (Dyal, 2016). Research on the impact of networks on the use of contraceptives has demonstrated a correlation between peer use and uptake(Valente & Pitts, 2017). Regarding the study, peer educator influence is external, unlike peer-to-peer influence. The influence of the peer educator to the network members may decay over time. This is in comparison to peer-to-peer influence since their interactions are likely to be more frequent.

Mechanisms: Network thresholds, network-weighted exposures, and structural equivalence are some of the ways that networks affect behavior (Valente & Pitts, 2017). When people accept innovations because they observe others who are similar to them doing the same, this is known as structural equivalence(Valente & Pitts, 2017). Regarding the study, the peer-to-peer (high-risk HIV-negative and newly diagnosed positive and their

social networks) engagement is at an equal level in comparison to a peer educator who has an elevated status given their role in the social network structure. Opinion leaders may be more adept than other people at spreading innovation within their society, according to the theory put out by network-weighted exposures (Valente & Pitts, 2017). In the case of the study, the peer educator has an elevated social standing and is exposed to new information on health. The peers have a say on who takes up the role of the peer educator. This means the peer educator has an easier time introducing innovation because of the respect given to them.

2.3 Empirical Studies

This section examines the literature available on the study variables. Empirical reviews provide an opportunity for testing the validity of different assumptions and theories.

2.3.1 Social Network Strategy for HIV Testing Services

Testing and knowledge of one's status establish the 95-95-95 HIV cascade, which serves as the foundation for care, treatment, prevention, and other support services (Mannoh et al., 2022). Social Network Strategy is a case-finding approach that reaches out to people who are most at risk of HIV by utilizing social network connections (Kimbrough et al., 2009). Peer educators recently diagnosed with HIV, and high-risk negative individuals are recruited to encourage members of their social, sexual, and drug-using networks to get tested for HIV. This is a peer-driven HIV testing program (Kimbrough et al., 2009). It is assumed that people who are part of the same social networks have an equal chance of contracting HIV (Kimbrough et al., 2009). It has been utilized to identify newly diagnosed cases of HIV within populations that face barriers to HIV testing services (Kimbrough et al., 2009).

The necessity for clearly defined tactics that are different from the general population to overcome the hurdles to uptake was supported by a study conducted on HIV testing and counseling among FSWs in Addis Katema, Ethiopia (Ameyan et al., 2015) The same technique was shown to be more successful in Ukraine in identifying tuberculosis cases among key populations than it was at routinely identifying instances in households within the general population (Masiuk et al., 2021).

To persuade members of their particular at-risk groups to modify hazardous sexual behaviors and sustain healthy sexual behaviors, key population programming makes use of the peer education technique (He et al., 2020). It allows for direct interpersonal interaction which encourages the build-up of trust that results in possible influence over peers (He et al., 2020) Information provided by network group members is likely to be perceived as credible and digested more actively than information from outsiders, according to experimental research (Hoffman et al., 2013)

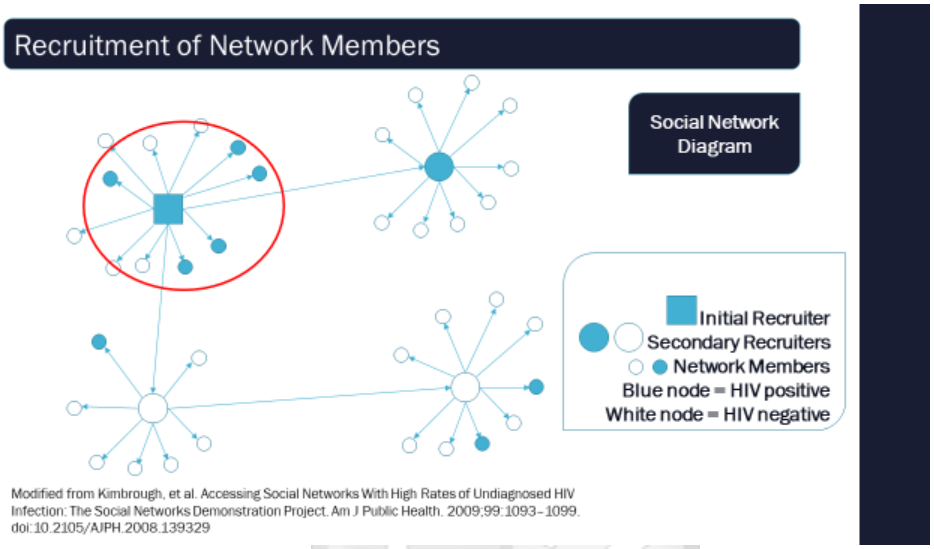


Figure 2: Social Network Diagram, (Kimbrough et al., 2009)

2.3.2 Social demographic characteristics and health-seeking behavior

Using respondent-driven sampling, a cross-sectional study comparing young female sex workers in Zimbabwe who were 18-24 years old with those who were 25 years and older examined their engagement in HIV care. The results corroborated estimates that 20-40% of FSWs worldwide began sex work as teenagers. Similar to other studies HIV prevalence was lower among young FSWs (Guure et al., 2023) This went against the findings of a study conducted in Cote d'Ivoire which used an HIV Recent Infection Algorithm (RITA) to assess HIV incidence and variables associated with it among female sex workers (Nouaman et al., 2022). Additional findings from the cross-sectional study comparing HIV care for younger and older female sex workers revealed that: 74% of young FSWs who

reported knowing their status were on antiretroviral therapy (ART) and 62% were virally suppressed. It is important to note that at the time, "test and treat" had not been implemented so some may not have been eligible for ART initiation. Additionally, there were fewer young HIV -positive FSWs reporting knowing their status, which may reflect the high incidence reported in some studies. The limitation of the study was the application of a lower age limit of 18 years, it is possible that those younger than 18 years are the most vulnerable and least engaged but were not represented in the study (Napierala et al., 2018). According to an article by Bekker & Hosek, (2015) HIV risk behavior is highest at young ages and decreases as one age or enters into serious relationships.

2.3.3 Social network influence on health-seeking behavior

A study conducted in Cộte d'Ivoire by Olawore et al., (2020) using routinely obtained program data results focused on peer recruitment tactics for female sex workers who are not enrolled in HIV prevention and treatment programs. The aim was to compare HIV-related outcomes between women contacted by both tactics and to characterize the features of female sex workers reached by the LINKAGES study with enhanced peer outreach and standard peer outreach. Between October 2017 and April 2018, normal programmatic data that had been deidentified was gathered and examined. Descriptive statistics were used to evaluate HIV testing history, demographics, case-finding, treatment initiation, and linkage to HIV therapy. Using Pearson chi-square tests, the outreach method was used to compare differences in these indicators. The research examined the variations in service uptake between regular and enhanced peer outreach. The overall case-finding rate was 7.8%, but the rates for enhanced peer outreach and routine outreach were 10.7% and 6.8% respectively. The enhanced peer outreach technique showed a greater percentage of connection to care, and treatment (95.9%) compared to normal outreach (71. Compared to the standard outreach approach, the studies indicated that the enhanced peer outreach approach, a novel peer-referral strategy, was more successful in contacting female sex workers Thus, to maximize HIV prevention and treatment outcomes, new approaches could be required. Information gaps and irregularities in data entry or collection could have had an impact on the outcomes. Some variables that could have affected the results could not be used because of missing data.

Craddock et al. (2022) conducted a cross-sectional study examining the relationship between social networks and individual-level characteristics and HIV testing, condom use, and interest in PrEP among young black women. The study found that 58% of young black women discussed HIV testing with at least one social network member, and 92% discussed condom use. Interestingly, those who discussed condom use with a sexual partner were 70% less likely to be interested in PrEP, but 2.99 times more likely to report condom use during their last sexual encounter. Additionally, those who discussed HIV with a sexual partner in the previous three months were 3.97 times more likely to have been tested for HIV. Surprisingly, individuals who had an HIV test in the previous three months were 63% less likely to be interested in taking PrEP. This suggests that individuals who discuss and use condoms regularly may be less inclined to consider PrEP. The study highlights the importance of understanding and addressing HIV risk behaviors within social networks, although the cross-sectional nature of the study limits the ability to establish causation.

It is argued that there are numerous statistical difficulties when attempting to establish causation with network effects(Valente & Pitts, 2017). Many times, network data are not independent, which goes against the fundamental tenet of inferential statistical analysis (Valente & Pitts, 2017). Additionally, there is endogenous tie formation, in which an individual forms friendships with friends of friends; although these new relationships appear to be influenced, they result from organic network evolution (Valente & Pitts, 2017). Latent homophily is the term for the possibility that people are linked to one another even though their reasons for being connected were not noted in the study(Valente & Pitts, 2017). To correct for this, data should be collected longitudinally, at many time points(Valente & Pitts, 2017).

Using regular program data, a retrospective cohort analysis was carried out by, Masiuk et al., (2021), titled “Breaking the paradigm: Optimized Case Finding (OCF) Multiplies Tuberculosis (TB) Detection among Key Populations in Ukraine.” It aimed to examine how well the OCF strategy- which required having every contact in an index TB case’s social network evaluated for TB- was being implemented. The study demonstrated that TB might be detected by looking into a small number of contacts. The method outperformed active case finding in households by 3.6 times and passive case finding in the broader

public by 66 times. Remarkably, OCF was able to successfully link 99% of all TB patients to therapy. Given that key populations are frequently excluded from the purview of standard health systems, the efficiency of TB detection and linkage was praiseworthy. A constraint for the research, aside from the practical challenges encountered in a particular area, was the inability to identify the principal source of infection. This is a great illustration of how innovative new models may be demonstrated through operational research utilizing "real life" program data, shifting from "doing more of the same" to " doing things differently (Rujumba & Byamugisha, 2012; Walley et al., 2007).

In their study titled "Female sex worker social networks and STI/HIV Prevention in South China," Tucker et al. (2011) found that female sex workers who had social connections from their hometown within their networks were more inclined to accept STI/HIV testing and trust local sexual health services. The study aimed to explore the social networks of low-income female sex workers and their potential role in promoting sexual health. It highlighted that relationships among women working in the same location were not as effective in understanding the risks and challenges of commercial sex as connections within their local social networks. The qualitative study involved semi-structured interviews with 34 low-income female sex workers and 28 members of a health outreach program, focusing on how social interactions influenced STI/HIV testing, condom use and negotiation, health-seeking behavior, and management of violent clients.

In their 2019 cross-sectional study, Carrasco et al. examined the relationship between social cohesion and consistent condom use (CCU) and STIs among female sex workers (FSWs) living with HIV in the Dominican Republic. The study revealed that social cohesion was significantly associated with CCU between FSWs living with HIV and their clients, as well as with the prevalence of STIs. However, social cohesiveness between FSWs living with HIV and stable spouses did not correlate with CCU. The study suggested that gender power dynamics in stable partnerships might be more prevalent, leading women to be more inclined to accommodate their partners' needs. Due to the lack of temporal information in the cross-sectional investigation, causal conclusions could not be drawn, and the generalizability of the results was limited by the non-random hybrid sampling strategy used. Additionally, the study relied on self-report data for analysis, which could

have introduced social desirability and reporting bias. Similarly, a study in Swaziland by Fonner et al. (2014) on social cohesiveness among FSWs and regular condom use yielded comparable results.

A retrospective study was conducted in the Oromia region, Ethiopia by Uma et al., (2022). It sought to determine the prevalence of HIV and related variables among high-risk persons who were recruited using a social network approach. 2018 saw the region begin putting the creative strategy into practice. Information was gathered from Social Network Strategy registers using a data extraction form. The results indicated that there was a substantial correlation between HIV infection and recruiter's HIV status, age, and male sex. The younger age group had a higher chance of infection, which is consistent with a US study (Veinot et al., 2016). According to the study, the males were 5.48 times more likely to get HIV than the females which contradicted the South African study that found females were 1.38 times more likely to have HIV (Davey et al., 2019). Studies in Ethiopia have shown the same picture, females have a higher likelihood of getting HIV. Because high-risk males were the focus of the study rather than the broader community, the conflicting results were noted. In contrast to a study conducted in Mexico, where 10% of subjects recruited by HIV-positive recruiters/seeds were found to be HIV-positive, and 4.1% of subjects recruited by HIV-negative recruiters tested positive for HIV, the Oromia study revealed that subjects whose recruiters were high-risk negative had a 1.54 times higher likelihood of being HIV positive (Abramovitz et al., 2009). It's important to note that the study's findings may not be widely applicable due to its reliance on data from facility records.

Yang et al. (2020) conducted a systematic review and meta-analysis to assess the impact of Social Network Strategy (SNS) on HIV prevention among key populations. The study included a search of six databases, including PubMed, Web of Science, Embase, Cochrane Library, ScienceDirect, and Wiley, for randomized control trials published between January 1999 and May 2019. The findings indicated that SNS was associated with a significant decrease in HIV seroconversion, a reduction in unprotected encounters and sex with multiple partners, an increase in the adoption of HIV services, and higher participant retention rates. According to a critical review by Latkin and Knowlton (2015), social networks play a crucial role in influencing health-related behaviors. The review highlighted

the importance of social networks in behavior change strategies to enhance the effectiveness, scope, and financial implications of health promotion interventions. It also discussed challenges associated with evaluating social networks relevant to health behaviors. Describe the methodology utilized to develop behavior change methods for network interventions, as well as the mechanisms underlying both positive and negative social influences on behavior change at the individual and network levels. It also suggested future directions for research and looked at methodological problems with network interventions.

With randomized controlled trials of social network interventions showing persistent behavior change for more than two years; the paper supports the successful use of social network interventions over the past 20 years to reduce HIV risk behaviors in high-risk and difficult-to-reach. It is possible to use social network interventions to advance social norms(C. Latkin et al., 2013). Members of the network may do this by rewarding or penalizing others for participating in particular behaviors or by setting an example of actions that boost response efficacy and self-efficacy(C. Latkin et al., 2013). Social behaviors that put one at risk for HIV might be perceived as typical by those who engage in them with others, particularly if those others do not express disapproval(C. Latkin et al., 2013). Therefore structuring messages that emphasize health promotion norms and making sure that close network members are aware of their peers' positive health behavior enhances network-level behavior change(C. Latkin et al., 2013).

Though it might not be able to maintain behavior change, social network support from weak ties can improve wellbeing(C. A. Latkin & Knowlton, 2015). Adequate opportunity to effectively promote the intended behavior is provided by the network's stability and frequency of interactions(C. A. Latkin & Knowlton, 2015)

2.3.4 HIV Testing Services Strategies

The statistics regarding HIV prevalence among Female Sex Workers (FSWs) in Kenya necessitate urgent and targeted interventions. With strategic allocation of resources and an emphasis on reaching female sex workers and other vulnerable populations, Kenya can work towards curbing the HIV epidemic and achieving the global goal of ending AIDS by 2030. The process calls for coordinated actions, evidence-based strategies, and a shared

determination to significantly improve the lives of people impacted by this difficult public health challenge (UNAIDS, 2023).

HIV testing strategies used include; HIV Self-Testing (HIVST), Index client testing, Voluntary Counseling and Testing (VCT), and Social Network Strategy (SNS)(Kenya-ARV-Guidelines, 2022).

HIVST enables individuals to obtain their sample, do the test, and decipher the outcome (Kenya ARV Guidelines, 2022). The main documented barrier to this approach is a fear of reactive testing and a lack of confidence in one's diagnosis (Nnko et al., 2020). This is on top of the requirement for providing sufficient counseling and referral services (Nnko et al., 2020). Index client testing is referred to as partner testing or partner notification services (Kenya-ARV-Guidelines, 2022). It is a strategy that involves inviting and testing exposed contacts, such as sexual partners, biological children, and partners who share needles with an HIV-positive individual (Kenya ARV Guidelines, 2022). Its challenges include issues with privacy, inaccurate contact information, logistical obstacles to tracing, and above all the attitude of healthcare providers(Meek et al., 2023).

Voluntary Counseling and Testing (VCT) refers to the offering of HIV testing services to those who voluntarily visit medical facilities for testing for a variety of purposes (Kenya-ARV-Guidelines, 2022). Compared to the general population certain populations such as female sex workers (FSWs) face noticeably increased chances of contracting HIV (UNAIDS, 2022). Consequently, it is essential to develop and customize testing strategies to fit the particular requirements and conditions of these groups.

The application of generalized testing strategies for HIV may not be adequate when it comes to reaching key populations. Innovative approaches, such as the Social Network Strategy for HTS, are crucial in maximizing testing uptake and reaching undiagnosed individuals.

A safe, efficient, and accepting environment that attracts sex workers to its services is the goal of the ethical and progressive health sector's reaction to sex work. However, due to stigma and discrimination, the clinical setting is frequently a site where human rights are violated (Richter & Buthelezi, 2021). This is a significant obstacle to the efficient

prevention, care, treatment, and support of HIV and Sexually Transmitted Infections (STIS). Peer-led programs and other rights-affirming initiatives created in collaboration with sex workers are examples of recommended policies (Richter & Buthelezi, 2021).

Social network testing is an alternative approach to HIV testing and diagnosis that involves leveraging social networks to identify and test individuals who may be at risk of HIV infection. In this approach, individuals are tested, and their social networks are mapped to identify other individuals who may be at risk(Kimbrough et al., 2009). This approach has been successful in reaching key populations such as female sex workers, who often have strong social networks that can be leveraged for HIV testing and diagnosis (WHO, 2019)

The global literature on social networks and HIV was subjected to bibliometric analysis, which revealed an uneven geographical distribution of publications on the subject. Specifically, high-income countries have a comparatively higher number of publications available than low and middle-income countries with high HIV prevalence (Doan et al., 2022). Furthermore, only roughly 7% of the chosen papers included an intervention design, indicating that social networks are still not widely used in developing HIV-related interventions (Doan et al., 2022). These strategies should be scaled up in developing countries as they approach epidemic control, conscious of regional context.

Of note is that behavioral change interventions rely on the behaviors and cultures of target populations and must therefore be contextualized to obtain the highest effectiveness(Doan et al., 2022). Additionally, more data must be gathered about how networks both influence and are influenced by behavior to articulate the context and circumstances in which these effects take place (Valente & Pitts, 2017). Doan (2022) studied the application of social networks in HIV and the conclusion was that the focus was high-income areas. This illustrated the need to do more research on these strategies in low-income high-budget countries.

Social Network Strategy (SNS) is a case-finding approach that reaches out to those with the highest HIV risk through social network linkages (Kimbrough et al., 2009). Peer educators recently diagnosed HIV-positive individuals, and high-risk negative individuals are recruited to encourage members of their social, sexual, and drug-using networks to get tested for HIV. This is a peer-driven HIV testing program.(Kimbrough et al., 2009) A

social network is a collection of connections made by individuals who communicate and have similar interests (Shushtari et al., 2018). The interaction may impact the members' behavior and health results (Shushtari et al., 2018). When people alter their behavior to fit in with their peer group, it is when they influence them(Valente & Pitts, 2017). On the other hand, individuals can also make network changes consistent with their behavior. This is referred to as selection (Valente & Pitts, 2017).

Social network members are more likely to trust one another, share a similar risk of HIV, and be open to adopting behaviors that other members of their network support. These characteristics are the foundation of social network strategy or SNS (Stojanovski et al., 2021). SNS recruits the initial group of individuals with an increased risk of HIV or living with HIV as "seeds"(Stojanovski et al., 2021). After that, they have to encourage people in their social networks to get tested for HIV and use services for prevention or treatment (Stojanovski et al., 2021). The seed can be a peer educator, a person just diagnosed with HIV, or a person who tested negative for the virus and was evaluated using the national standard technique to be at high risk of acquiring HIV (Kimbrough et al., 2009) . Healthcare providers mentor them so they can find network members to convince and sway to pursue testing (Stojanovski et al., 2021).

The study focused on network influence that occurs through structural equivalence and network-weighted exposure. Structural equivalence is whereby the seed/recruiter as a peer, reaches out to fellow peers as in the case of the newly diagnosed HIV-positive seed or the high-risk negative seed. In comparison, a peer educator is chosen by the female sex workers to be the liaison between them and the health facility. Individuals may feel pressured to adapt to a change or innovation when they see people equivalent to them do the same. On the other hand, network-weighted exposure might be the mechanism of influence. This is whereby opinion leaders such as peer educators may have great influence given their position on the social structure (Valente & Pitts, 2017).

The study sought to provide information on the case identification rates among the different seed/recruiter types and subsequent linkage to prevention or treatment and continuity of treatment. Social Network Strategy as an intervention for HTS was introduced in 2019 in Kenya for key populations through the Key Population Improvement Funds, it has so far

been scaled up to include men, adolescents, and young persons as per the 2022 National HIV Testing Guidelines (Kenya HTS Manual, 2022) The intervention entails, the HIV Testing Service (HTS) Provider taking the participants through a coaching process, to empower them to raise the conversation on HIV with their social network members and refer them for services(Kimbrough et al., 2009). To establish that it is a social influence that is attributable to the behavioral change observed, there is a need to control for confounding factors such as a) endogenous tie, whereby people will become friends with friends of their friends, b) latent homophily, unobserved reasons for why people are connected (Valente & Pitts, 2017). These connections may result in behavior change but may not sustain the change (Valente & Pitts, 2017). Latent homophily may explain the association between behavior and networks at baseline however over long periods the effects of homophily diminish and influence kicks in (Valente & Pitts, 2017). To establish that social influence has taken place, there is a need to look at the cohort under the study longitudinally (Valente & Pitts, 2017), hence the need for looking at 12-month follow-up and viral suppression for the social network members initiated on care and treatment.

VT OMNES
VNVM SINT

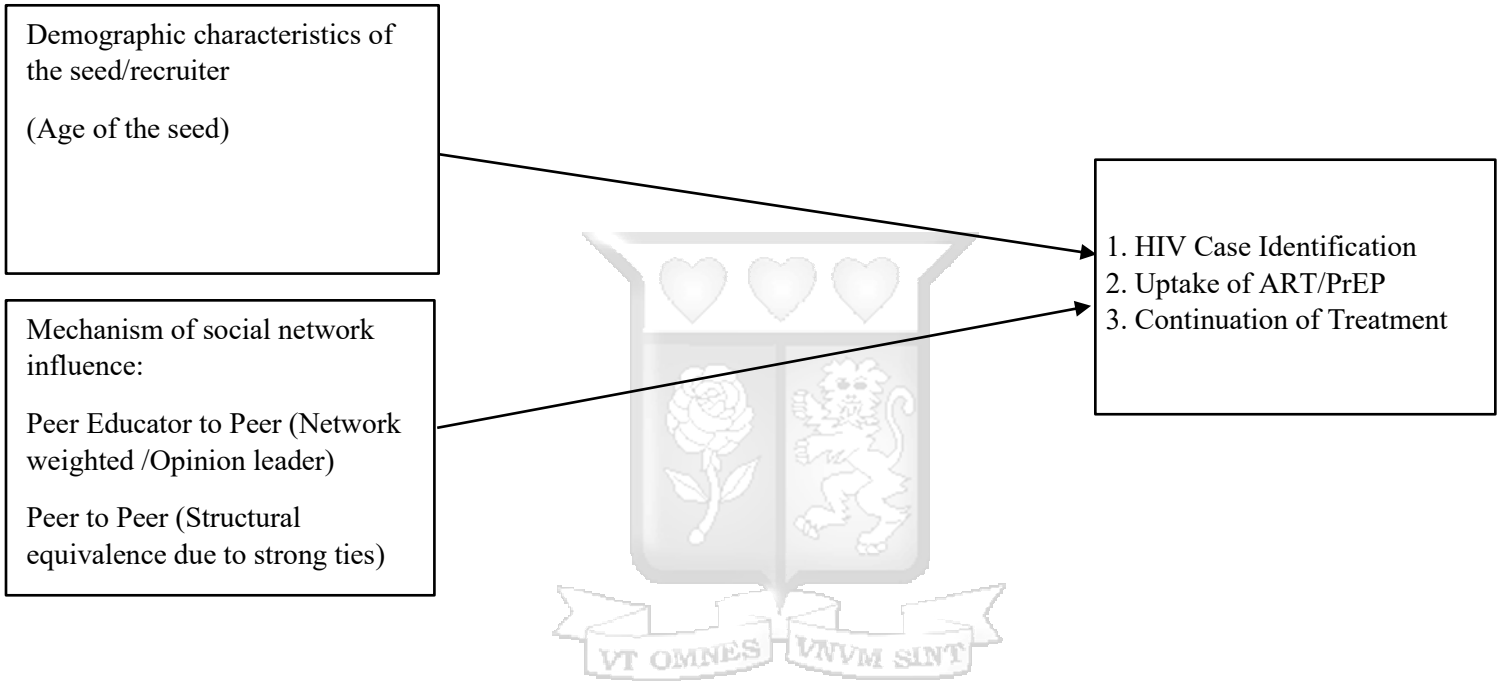
The study sought to address two main research gaps outlined in the table below. The first one is context, in terms of the area of study (HIV), study population, and geographical region. The study focused on the use of a social network strategy in accessing HIV services, among female sex workers in Nairobi Kenya. The second gap that it addressed was the opportunity to make inferences. This may not be possible with cross-sectional data hence the use of longitudinal data. The use of longitudinal data rather than cross-sectional has been recommended by other studies.

Table 1: Research Gaps

Author	Title	Findings	Research Gap
Oluwasolape Olawore, Hibist Astatke, Tiffany Lillie, Navindra Persaud, Carrie Lyons Didier Kamali3, Rose Wilcher, Stefan Baral	"Peer Recruitment Strategies for Female Sex Workers Not Engaged in HIV Prevention and Treatment Services in Côte d'Ivoire: Program Data Analysis"	Enhanced outreach peer approach was associated with a higher HIV case-finding, higher proportion of linkage to treatment, and higher proportion of initiation to treatment	Different context, the setting is Cộte d'Ivoire. Missing data may have limited ability to use certain variables. The study looked at a period within one fiscal year, similar results may not be observed in other periods
Jaih B. Craddock Nancy D. Franke Caroline Kingori	"Associations of Social Network- and Individual-Level Factors with HIV Testing, Condom Use, and Interest in PrEP Among Young Black Women"	Speaking about condoms with a sex partner lowered the odds of being interested in PrEP but increased the odds of condom use. Speaking of HIV to a sex partner increased the odds of having been tested in the prior 3 months. The odds of agreeing to take PrEP reduced for those tested in the prior 3 months	The study being cross-sectional limited the ability to make causal links between HIV prevention behaviours and individual and social network level factors additionally it being respondent driven, the sample might have had homogenous behaviour in which case statistical inference should be taken with caution. A longitudinal study would address these concerns. The proposed study shall look at 12-month retention on ART and viral suppression to be able to establish the influence
Liliia Masiuk, Olga Denisiuk, Evgenia Geliukh, Garry Aslanyan, Rony Zachariah, Zahedul Islam	"Breaking the paradigm: Optimized Case Finding multiplies tuberculosis detection among key populations in Ukraine"	The OCF strategy among key populations is very effective in identifying TB cases and involving them in treatment through the recruitment of contacts from the risk social networks	The context is different, that is TB, and the setting is Ukraine. The proposed study will be looking at social network intervention for HIV services among sex workers in Kenya, Nairobi
Joseph D Tucker, Hua Peng, Kaidi Wang, Helena Chang, Sen-Miao Zhang, Li-Gang Yang, Bin Yang	Female sex worker social n etworks and STI/HIV prevention in South China	FSWs 'hometown social connections' were more powerful when it came to a willingness to accept STI/HIV testing and trusting local sexual health services. The relationship affected condom use and health-seeking behaviour.	The study may not be generalizable, and the context/setting is in South China. The proposed study will focus on sex workers in Kenya, Nairobi

M A Carrasco, C Barrington, M Perez, Y Donastorg , D Kerrigan	Social cohesion, condom use, and sexually transmitted infections among female sex workers living with HIV in the Dominican Republic	Social cohesion was significantly associated with CCU between FSWs living with HIV and their clients and STI prevalence. However social cohesion was not associated with CCU between FSWs living with HIV and their steady partners	The study was cross-sectional therefore causal inferences could not be made given the lack of information about temporality, and the non-random hybrid sampling approach utilized limited the generalizability of the findings. Also except for STI prevalence the data analyzed was based on self-report, which might have introduced social desirability and reporting bias
Teka Haile, Amanuel Lamessa, Yonas Mekonnen, Meseret Ifa	HIV Prevalence and Associated Factors Among High-Risk Individuals Recruited Through Social Network Strategy in Oromia Region, Ethiopia: A Retrospective Study	The risk of HIV infection was higher among the younger age group. Male clients recruited through social network strategy had a higher risk of HIV infection. Similarly, clients whose recruiters were high-risk HIV-negative status had a higher risk of HIV infection.	Different context, since the study is not particularly focused on female sex workers. The study will cover female sex workers
Xing Yang, Ting Fang, Siam Ai Mobarak, Jing Wang, Can Wang , Shan Huang , Li Jiang , Xi Chen , Hongzhan Li , Weiwei Chang , Lei Zhang , Jieling Mo , Chuanyi Ning	Social network strategy as a promising intervention to better reach key populations for promoting HIV prevention: a systematic review and meta-analysis,	The findings showed that SNS was associated with less unprotected intercourse, and sex with multiple partners, significantly reduced HIV seroconversion, improved HIV services uptake, and enhanced participant retention. Of note, these were randomized control trials	Different context- the studies did not focus on Sub-Saharan Africa, the study will focus on Nairobi, Kemya

Figure 3: Conceptual Framework on Structural Equivalence and Network Weight within the Network Structure



There are two types of relationships: -

- Peer educator and her social network members, which functions on the network-weighted mechanism of influence. Where the social networks are influenced by the fact that peer educators are leaders among them.

- Peer to peers, that is high-risk negative or newly diagnosed positive, and their social networks. The type of influence is structural equivalence, that is the similarities among network members and the strength of the relationship.

These elements explain how the characteristics of the seed (recruiter) and the specific relationship with network members may influence or predict positivity within the social networks and subsequent initiation of PrEP for those testing negative and linkage to care and treatment for the ones testing positive for HIV. Peer-to-peer relationships are seen as structurally equivalent (high-risk negative seeds and newly identified seeds relate on a peer-to-peer level) whereas a peer educator has a higher status in the network structure and his/her influence may be more about network weight. The information a peer educator is passing to the network is considered credible given his/her position.

Table 2: Operationalization of Study Variables

Checklist	Variable Identification	Type of variable	Suggested statistical measure	Source Register
Section 1	Personal Information 1. Age 2. Sex 3. Type of seed	Nominal Ordinal Ratio	Descriptive Mean SD Inferential Comparisons Relationships	SNS Register
Section 2	Type of seed/recruiter 1. Newly Identified HIV Positive (NP) 2. High-risk Negative (HN) 3. Peer Educator (PE) Social Networks Information 1 Number of social contacts referred for testing. 2 Number of contacts testing negative 3 Number of contacts testing negative initiated on PrEP 4 Number of contacts testing negative still in the program 1 year after enrolment 5 Number of contacts testing positive 6 Number of contacts testing positive linked to ART	Nominal Ordinal Ratio	Descriptive Mean SD Inferential Comparisons Relationships	SNS Register MOH 362 (HTS and Lab register) ART Cohort Register/Kenya EMR

	7 Number of contacts linked to care and treatment retained at 12 months follow-up. 8 Number virally suppressed. 9 Number of contacts recruited as secondary seeds			
Section 3	Contribution to overall positivity 1. Overall number of positive case identification 2. Number of positive tests from SNS for HTS 3. Ratio of linkage to ART from different testing modalities	Nominal Ratio	Inferential Comparisons	MOH 362 (HTS. LAB & Linkage register)

2.4 Conclusion

The majority of key populations and priority populations are unaware of their HIV status or lack access to treatment, UNAIDS Global AIDS Strategy (2021-2026) shows inequalities that drive the AIDS epidemic, it places people at the center to get the world on track to end AIDS as a public health threat by 2030 (UNAIDS, 2021). These populations are disproportionately affected by HIV due to risk behaviors, stigma, discrimination, violence, human rights violations, and criminalization, all of which hinder access to healthcare services (UNAIDS, 2021). SNS for HTS seeks to reach out to the deeper networks of the key populations who would otherwise not be reached through regular HTS strategies. In the quest to reach the first 95%, within the set timelines, innovative ways of reaching the hidden population are recommended, also keeping in mind the dwindling resources.

CHAPTER THREE
RESEARCH METHODOLOGY

3.0 Introduction

This chapter delves into how the research was conducted, the study area, study design, sampling method and procedure, data quality, data analysis, and ethical considerations.

3.1 Research Philosophy

The study being quantitative, will take the positivist worldview. The positivist view focuses on cause and effect, and it is, therefore, deterministic. It is about finding the causes that could have produced specific outcomes. It is also reductionist in that it reduces the causes to a small set of ideas that can be tested. The whole can be understood by knowing the smaller parts. This may include objects, theories, phenomena, and explanations (Thomas, 2021)

3.2 Research Study Area

The study was conducted at 10 Drop-In Centers and one key population-integrated public health facility within Nairobi County providing services to female sex workers. One Drop In Centre, BHESP Kariobangi did not have the Social Network Strategy register which was a primary data source. These health facilities provide combination prevention interventions for key populations; that is biomedical, behavioral, and structural interventions.

3.3 Research Design

The study is a retrospective cohort study, involving analysis of routinely collected program data. In retrospective studies, the outcomes of interest have already occurred and data is gathered from records or asking participants to recall exposure(Ranganathan & Aggarwal, 2018).

Many times, network data are not independent, which goes against the fundamental tenet of inferential statistical analysis (Valente & Pitts, 2017). To correct for this, data should be collected longitudinally. To establish that social influence has taken place, there is a need to look at the cohort under the study longitudinally (Valente & Pitts, 2017), hence the need for looking at 12-month follow-up and viral suppression for the social network members

initiated on care and treatment. This is in addition to examining the persistence on Pre Exposure Prophylaxis (PrEP) at 12 months follow-up. The most appropriate design given the resources available in terms of cost and time was retrospective.

Secondary data also provides an opportunity for theory-driven research hence the choice of study design (Serra et al., 2018). In addition, it is possible to combat the epidemic effectively and efficiently by using programmatic data to understand people and guide the program execution (Olawore et al., 2020).

Data on female sex workers participating in the social network strategy for HIV testing services in the fiscal year October 2021 to December 2022 was collected and studied.

3.4 Study Population

This constituted female sex workers reached with services across all Drop-in Centres and one integrated public health facility in Nairobi County.

3.5 Sampling Frame

The sampling frame had all female sex workers receiving combination interventions for HIV between October 2021 to September 2022, across the 10 Drop-In Centers and one integrated public health facility in Nairobi County.

3.5.1Sampling Technique

The selection of all Drop-in Centres and the integrated public health facility was purposive. All facilities providing services to female sex workers within the county were part of the study. This is because of the small number of female sex workers participating in the intervention. All female sex workers recruited as seeds were included in the study. The number of seeds recruited over the one year was 1170 across the 11 facilities: 286 New Positive, 867 High-Risk Negative, and 17 Peer Educators.

3.6 Data Collection Method

Quantitative data for one year (October 2021-September 2022) was collected using a data extraction form through the Open Data Kit (ODK) software, a mobile data collection platform. Data was collected from SNS registers, and verification of HIV testing results

was done using MOH 362 registers (HTS Laboratory and Linkage Register), verification of initiation on ART and PrEP was done using the ART Cohort register, PrEP register, and Kenya Electronic Medical Records (EMR). The data was exported to a spreadsheet that was cleaned before analysis.

3.7 Measures of Reliability and Validity

To ensure the reliability and validity of the study, a pilot test at SWOP Thika Drop In Centre, was conducted to assess the data collection method and instrument, that is the extraction tool on Open Data Kit (ODK). Additionally, data documented on the Social Network Strategy (SNS) register was verified against other tools, including the HIV Testing Services (HTS) linkage and referral Laboratory register, PrEP register, ART Cohort register, and Electronic Medical Record. This verification process goal was to confirm HIV testing results and linkage to PrEP or ART as documented on the SNS register.

3.8 Data Analysis and Presentation

Quantitative data

The data was cleaned and analyzed using Excel and SPSS. Numerical data was summarized using descriptive statistics, that is measures of central tendency in the case of the age of the seed. Categorical data, for instance, the type of seed was analyzed using proportions and frequencies.

To establish relationships between the variables, measures of the association including chi-square and odds ratio were used, in making inferences. This established whether the type of seed influenced positivity, acceptability of Pre-Exposure Prophylaxis for HIV, linkage to ART and subsequent continuity in follow-up.

3.9 Ethical Considerations

Approval to carry out the research was sought from the relevant bodies. A research permit to carry out the study was sought from the National Council for Science and Technology (NACOSTI) after the acquisition of approval from the Strathmore University Institutional Scientific and Ethical Research Committee (SU-IERC). Data was collected from registers

and Kenya Electronic Medical Reports. During the data collection process, no personal identifiers were present. Each participant was identified by their enrolment serial number. Access to the database used in the study was limited to authorized persons and remained in a secure password-protected computer. No individual patient was identified when the results of the study were presented.

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CHAPTER FOUR

PRESENTATION AND ANALYSIS OF RESEARCH FINDINGS

4.1 Introduction

The study findings and interpretations are presented in this section. Descriptive and inferential statistics are provided about the seeds (recruiters) participating in the social network strategy. Their influence over their peers on access to HIV preventive and curative services and continuity in follow-up was assessed. The study examines the influence of peer-to-peer (this includes high-risk HIV negative and newly diagnosed HIV-positive) against the influence that peer educators have over the peers. The analysis data was collected over one fiscal year, October 2021 to September 2022. Data was collected from ten Drop-In Centres and one integrated public facility, Kware Dispensary (Table 4.1).

Table 3: Seeds Demographic Characteristics

Variable	**Frequency**	**Percentage**
SNS Seeds		
Peer Educator	17	*1%*
HIV Positive	286	*24%*
High Risk Negative	867	*74%*
Seeds per Facility		
SWOP Majengo	174	*15%*
SWOP Kariobangi	149	*13%*
SWOP Thika	136	*12%*
SWOP Donholm	123	*11%*
SWOP Kawangware	121	*10%*
SWOP City	114	*10%*
Sokoni Arcade	114	*10%*
SWOP Kibra	101	*9%*
Nairobi Deaf	63	*5%*
BHESP Roysambu	54	*5%*
Kware Dispensary	21	*2%*
Confirmed HIV status		

Negative	884	*76%*
Positive	286	*24%*
Age		
Mean (Range)	33(16-68)	
Age Group		
<=20 Years	33	*3%*
21-30 Years	465	*40%*
31-40 Years	*470*	*40%*
>40 Years	*202*	*17%*
Number of social network members		
Mean (Range)	4(1-5)	

4.2 Seeds Demographic Characteristics

All the seeds/recruiters participating in the intervention were sampled, that is 1,170 across the 11 facilities (Table 4.1.1). The peer educators were 17 and the peers were 1,153, of whom 286 were newly diagnosed HIV positive and 867 were newly diagnosed HIV Negative at high risk of acquiring HIV infection (Table 4.1.1). All the peer educators participating were confirmed to be HIV-negative (Table 4.1.1). The mean age of the seeds was 33, with an average of 4 peers referred for services (Table 4.1.1).

Table 4: Social Network Contacts Demographic Characteristics

Variable	**Frequency**	**Percentage**
Social Contacts per facility		
SWOP Kawangware	541	*15%*
SWOP Thika	470	*13%*
SWOP Kariobangi	453	*13%*
SWOP Donholm	401	*11%*
Sokoni Arcade	368	*11%*
SWOP Majengo	326	*9%*
SWOP Kibra	294	*8%*
SWOP City	262	*7%*
BHESP Roysambu	187	*5%*

Nairobi Deaf	156	*4%*
Kware Dispensary	40	*1%*
Age		
Mean (Range)	33(17-73)	
Confirmed HIV Test status		
Negative	3318	*95%*
Positive	180	*5%*
Linkage to PrEP for Negatives (N=3318)		
Linked	2127	*64%*
Not Linked	1191	*36%*
Retention on PrEP (N=2127)		
Active	1114	*52%*
LTFU	1007	*47%*
Transfer Out	6	*1%*
Social network member viral load results (N=180)		
<1000 copies	146	*81%*
=>1000 copies	5	*3%*
None	29	*16%*
ART continuity in treatment status at 1 year (N=180)		
Active	132	*73%*
Transferred Out	10	*65*
Interrupted Treatment	36	*20%*
Dead	2	*1%*

Social Network Members' Demographic Characteristics

The number of referred social network members was 3,498, with a mean age of 33 years (Table 4.1.2). Of the 3,498 referred 180 (5%) tested positive whereas 3,318 tested HIV negative (Table 4.1.2). The number linked to PrEP was 2,127, this was 64% of the social network contacts who tested negative for HIV (Table 4.1.2). At one year follow-up, slightly more than half were active on PrEP, that is 1114 (52%). Interruptions in PrEP within the year were not accounted for. The number linked to ART was 178 (99%) (Table 4.2.1). 151 had a viral load result of whom 146 were suppressed, a 97% suppression rate. At one year follow-up 132 out of the 178 social network contacts linked to ART were still active on care, a retention rate of 73%, while 36 (20%) had interrupted treatment, 10 (6%) had transferred out and 2(1%) deaths were reported (Table 4.1.2).

4.3 Age of the Seed and HIV Case Identification

The seeds' ages were categorized into 4; those less than 20, 21-30, 31-40, and over 40 years. The relationship between age groups and HIV case identification, treatment linkage for positives, treatment linkage for negatives, and treatment continuity for those on ART and those starting PrEP were all established using chi-square analysis.

The age group of the seed was not significantly associated with HIV case identification. The yield among seeds within the age group of 21-30 years was the highest at 5.8%, followed by 31-40 at 4.9%, 4.7% for the above 40, and 2.3% for the less than 20 years (Table 4.2.1).

4.3.1 Age of the Seed and PrEP Linkage and Continuation

With a p-value of 0.037, there was very strong evidence of a relationship between the seed's age group and PrEP linkage.(Table 4.2.1). PrEP linkage percentage for the different age categories was highest for the less than 20 age group at 71.4%, 31-40 at 66.3%, 21-30 at 62.7%, and the above 40 age group at 61% (Table 4.2.1).

The seed's age group and PrEP continuation at one-year follow-up showed weak evidence of association at p-value of 0.087. The age group with the highest percentage of PrEP continuation was the one above 40 years at 56.9%, followed by the less than 20 years at 55%, followed by 31-40 years at 53.3%, and 20-31 years at 49.2% (Table 4.2.1).

4.3.2 Age of the Seed and ART Linkage and Continuity of Treatment

There was not enough evidence to suggest that there is an association between the seeds' age group and linkage to ART. All the age groups linked at 100% apart from those between 21-30 years which linked at 97% (Table 4.2.1). There was also no sufficient evidence to suggest an association between the age group of the seed and continuation in treatment on ART. However, one hundred percent of the social networks identified by seeds in the age category of less than 20 years were active on ART at one-year follow-up, followed by 77.5

% within the 30-41 category, 72.7% within the 20-31 age group and 70% for the above 40 years.

Table 5: Chi-Square Analysis of Age Group of Seed

			Age Group of Seed				
			<=20 Years	21-30 Years	31-40 Years	>40 Years	p-value
Social network member HIV test result	Negative	N	84	1262	1364	608	0.427
		% within Age Group	97.7%	94.2%	95.1%	95.3%	
	Positive	N	2	77	71	30	
		% within Age Group	2.3%	5.8%	4.9%	4.7%	
PrEP Linkage	Not Linked	N	24	470	459	237	0.037
		% within Age Group	28.6%	37.3%	33.7%	39.0%	
	Linked	Count	60	791	905	371	
		% within Age Group	71.4%	62.7%	66.3%	61.0%	
PrEP Retention	No	N	27	401	421	160	0.087
		% within Age Group	45.0%	50.8%	46.7%	43.1%	
	Yes	N	33	389	481	211	
		% within Age Group	55.0%	49.2%	53.3%	56.9%	
ART Linkage	No	N	0	2	0	0	0.444
		% within Age Group	0.0%	2.6%	0.0%	0.0%	
	Yes	N	2	75	71	30	
		% within Age Group	100.0%	97.4%	100.0%	100.0%	
ART Retention	No	N	0	21	16	9	0.692
		% within Age Group	0.0%	27.3%	22.5%	30.0%	
	Yes	N	2	56	55	21	
		% within Age Group	100.0%	72.7%	77.5%	70.0%	

4.4 Type of relationship between the seed and the peer and HIV case identification

Chi-Square was utilized to analyze the association between the type of seed and HIV case identification. The association between peer-to-peer and that of peer educators to peer was also analyzed.

Table 6: Chi-Square analysis for HIV Case Identification among the different types of seeds

		Seeds						
		High Risk Negative		New Positive		Peer Educator		p-value
		N	% Yield	N	% Yield	N	% Yield	
Social network HIV test result	Negative	2424	96%	848	92%	46	85%	
	Positive	101	4%	71	8%	8	15%	<0.01

4.4.1 An association between the type of seed and HIV case identification

A very strong association between the type of seed and HIV case identification was established, with a p-value of less than 0.01 (Table 4.3.1). The yield among the social network members referred by the peer educators was 15%, followed by the ones referred by newly diagnosed positive at 8%, and lastly by the high-risk negative at 4% (Table 4.3.1)

Table 7: Chi-Square analysis on HIV Case identification given the type of relationship between the seed and the social network member.

			Relationship Type		
			Peer Educator to Peer	Peer-to-Peer	p-value
Social network HIV test result	Negative	N	46	3272	<0.01
		% within Peer Type	85.2%	95.0%	
	Positive	N	8	172	
		% within Peer Type	14.8%	5.0%	

4.4.2 Association of the relationship between the seed and the peer and HIV case identification.

The relationship between the seed and the social network member was very strongly associated with HIV case identification with a p-value of less than 0.01 (Table 4.3.2). The yield among social network members referred to by the peer educator was 14.8% whereas the yield among social network members referred to by their fellow peers was 5%.

Table 8: Logistic regression to compare the type of relationship against social network member HIV positive result.

		B	S.E.	Wald	df	Sig.	Odd Ratio	95% C.I.for Odd Ratio	
								Lower	Upper
Step 1[a]	Social network HIV result	1.196	0.391	9.365	1	0.002	3.308	1.538	7.119
	Constant	3.068	0.362	71.957	1	0.000	21.500		

The peer educator's cohort had 3 times greater odds of identifying a positive (odds ratio of 3.308, 95% CI (1.538-7.119)) (Table 4.3.3) compared to the peer-to-peer cohort.

4.5 Relationship between the seed and the peer on linkage and continuation to PrEP and ART

Chi -square analysis was utilized to establish an association between the type of seed and linkage to ART and PrEP and continuity on the same among the social network members referred for services. The same analysis was done to establish an association between the type of relationship between the seed and the peer and its influence on linkage to PrEP and ART, and subsequent continuation on the same at one year follow up.

Table 9: Chi-Square analysis on the association between the type of seed and PrEP and ART linkage and continuity

			Seed			p-value
			High Risk Negative	New Positive	Peer Educator	
PrEP Linkage	Not Linked	N	906	257	27	<0.01
		% within Seed	37%	30%	59%	
	Linked	N	1517	591	19	
		% within Seed	63%	70%	41%	
PrEP Retention	No	N	706	293	10	0.414
		% within Seed	47%	50%	53%	
	Yes	N	808	297	9	
		% within Seed	53%	50%	47%	
ART Linkage	No	N	0	2	0	0.212
		% within Seed	0%	3%	0%	
	Yes	N	101	69	8	
		% within Seed	100%	97%	100%	
ART Retention	No	N	25	19	2	0.956
		% within Seed	25%	27%	25%	
	Yes	Count	76	52	6	
		% within Seed	75%	73%	75%	

4.5.1 Relationship between the type of seed, linkage and continuation PrEP.

There was a very strong relationship between the type of seed and PrEP linkage, with less than 0.01 p-value (Table 4.4.1). Linkage to PrEP for social network members referred by new positive was at 70%, followed by high-risk negative at 63%, and lastly by peer educators at 41% (Table 4.4.1). There was no sufficient evidence of an association between the type of seed and PrEP continuation at one-year follow-up. PrEP continuation for social

network members referred by high-risk negative was at 53%, at 50 for new positive, and 47% for those referred by peer educators (Table 4.4.1).

4.5.2 Association between the type of seed and ART linkage and continuation of treatment.

There was insufficient evidence to suggest an association between ART linkage and the type of seed. Linkage to ART among social network members identified through high-risk negative and peer educators was at 100%. In contrast, linkage for social network members identified through the new positive seeds was at 98.8% (Table 4.4.1). There was also insufficient evidence to suggest that there was a relationship between continuity in ART and the type of seed. At one year follow up 75% of social network members, referred by the high-risk negative and peer educators' seeds were still engaged in care. And 73% of social network members referred by new positive seeds were active in care treatment (Table 4.4.1).

Table 10: Chi-Square Analysis of the Type of Relationship Between the Seed and the Social Network Member and Its Influence on Linkage and Continuity in Treatment

Variable			Relationship Type		p-value
			Peer Educator to Peer	Peer-to-Peer	
PrEP Linkage	Not Linked	N	27	1163	<0.01
		% within Peer Type	58.7%	35.6%	
	Linked	N	19	2108	
		% within Peer Type	41.3%	64.4%	
PrEP Retention	No	N	10	999	0.654
		% within Peer Type	52.6%	47.5%	
	Yes	N	9	1105	
		% within Peer Type	47.4%	52.5%	
ART Linkage	No	N	0	2	0.759

		% within Peer Type	0.0%	1.2%	
	Yes	N	8	170	
		% within Peer Type	100.0%	98.8%	
ART Retention	No	N	2	44	0.666
		% within Peer Type	25.0%	25.6%	
	Yes	N	6	128	
		% within Peer Type	75.0%	74.4%	

4.5.3 Association of the type of relationship between the seed and the social network member regarding PrEP linkage

There was a very strong association between the type of relationship between the seed and the social network member regarding PrEP linkage, with a p-value of less than 0.01 (Table 4.4.2). The percentage linkage among social network members referred through peer to peer (high risk negative and new positive) was at 64.4% whereas for the peer educators, it was 41.3% (Table 4.4.2). The peer-to-peer cohort had 0.388 times greater odds of linking a social network member to PrEP (odds ratio of 0.388, 95% CI (0.215-0.701)) compared to the peer-educator-to-peer cohort (Table 4.4.3)

Table 11: Logistic regression for the type of relationship and PrEP linkage.

		B	S.E.	Wald	df	Sig.	Odd Ratio	95% C.I.for Odd Ratio	
								Lower	Upper
Step 1[a]	PrEP Linkage	-0.946	0.302	9.837	1	0.002	0.388	0.215	0.701
	Constant	4.709	0.230	417.565	1	0.000	110.947		

4.5.4 Association of the type of relationship between the seed and the social network member regarding PrEP Continuation

The type of relationship between the seed and the social network member was not sufficiently linked to PrEP continuation, according to the available data. PrEP continuation among members referred by their peers was 52.5% whereas those referred by peer educators was 47.4% (Table 4.4.2).

4.5.5 Association of the type of relationship between the seed and the social network member regarding ART Linkage & Continuation

There was insufficient evidence to suggest a connection between ART linkage and the type of relationship between the seed and the social network member. Linkage was 100% for the peer educators and 98% for the peers (Table 4.4.2). There was insufficient evidence to illustrate an association between the type of relationship and continuity in ART. 75% of social network members referred by peer educators were still active at 1-year follow-up, whereas 74.4 of those referred by their peers were still active on treatment (Table 4.4.2)

CHAPTER FIVE

DISCUSSION, CONCLUSIONS, RECOMMENDATIONS

5.1 Introduction

This section discusses the outcomes and findings for every objective, draws inferences from the data, and offers study-related recommendations.

5.2 Discussions

The study sought to establish how the type of relationship between the seed and the peer (social network member) influenced access to and continuity in follow-up of HIV services. It examined the demographic characteristics of the seeds participating in the social network strategy for HIV testing services. The mean age for both the seed/recruiters and the social network members was 33 years. Among the seeds, there were 17 (1%) peer educators, 286 (24%) HIV-positive individuals, and 867 (74%) high-risk negative individuals. They referred 3,498 of their social network members for HIV services, of whom 180 tested HIV positive, resulting in a yield of 5%. This result was consistent with a study by Stojanovski (2021), titled "A Systematic Review of Social Network Strategy to Optimize HIV Testing in Key Populations to End the Epidemic in the United States". According to Musyoki et al. (2021), case-finding rates in Kenya have remained low, between 1% and 1.5%, in detecting new HIV-positive cases. The social network strategy could address access concerns regarding hard-to-reach subpopulations within this population, who may still be unaware of their HIV status.

Of the 180 newly diagnosed HIV-positive patients, 178 were linked to ART, a linkage rate of 99%. Continuation of treatment for HIV-positive female sex workers at one-year follow-up was 73% (132/178), with a viral suppression rate of 97% (146/151) among those active in care and treatment. Mountain et al., (2014) study established that discontinuation among female sex workers in one of the Kenyan cohorts was 10% at 6 months to 21% at 12 months. This is consistent with the study finding of a 20% treatment interruption rate at 12 months follow-up. Moreover, the Mountain's study showed that viral suppression rose from 40% after 3 months on ART to 73% after 6/12 on ART. And an estimated death of

6% whereas this study's death rate at 12 months was 1%. Out of the 3,318 social network members who tested negative for HIV, 64% (2,127) were linked to PrEP, with slightly over half 52% (1,114) of this number active on PrEP at one-year follow-up. This initiation rate is close to Mpirirwe et al., (2024) study, which established 63% overall uptake of PrEP among female sex workers in Sub-Saharan Africa. Like this study, it also revealed that older female sex workers had a lower probability of stopping PrEP, proportionately. However, for this study, this was not statistically significant.

5.2.1 Association between demographic characteristics of the seed with HIV case identification, ART and PrEP initiation and continuity in treatment

The seeds were categorized into four age groups: less than 20 years, 21-30 years, 31-40 years, and above 40 years. Statistical analysis revealed a significant association between age groups and PrEP linkage rates. The under-20 age group demonstrated the highest linkage rate at 71%, indicating a strong propensity for PrEP uptake within this demographic.

Conversely, no significant association was observed between age groups and other key outcomes, including HIV case identification, linkage to ART, and continuity in PrEP or ART. This contrasts Uma et al., (2022a) study on social network strategy in Ethiopia, which showed that the age category of recruiter/seed was significantly associated with new positive HIV results. Overall, this suggests that age may be a critical factor specifically in the context of PrEP initiation but not necessarily in the broader spectrum of HIV treatment and continuity.

The findings highlight the potential benefits of targeted interventions focusing on young female sex workers to mobilize their peers for PrEP initiation. Engaging this younger cohort could significantly enhance PrEP uptake rates, leveraging peer influence and age-specific outreach strategies. This approach underscores the necessity of age-tailored HIV prevention efforts to address the unique needs and behaviors of younger populations effectively.

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5.2.2 The type of relationship between the seed and peer and HIV case identification

The relationship between a seed and a peer can be categorized into two types: peer educator to peer and peer-to-peer (high-risk HIV-negative and HIV-positive seeds to peers). Peer educators act as liaisons between health facilities and peers, occupying leadership roles within their communities. This relationship is typically less intimate as peer educators facilitate connections and provide guidance rather than engaging in close personal interactions. In contrast, the relationships between HIV-negative and HIV-positive seeds and their peers are more intimate. These seeds refer friends whom they know well and with whom they can discuss HIV and other health issues openly. This closer relationship allows for more personal and meaningful interactions, fostering a supportive environment for health discussions and referrals. A study conducted in Mexico showed more yield among HIV-positive recruiters/seeds at 10% and 4.1% among social networks whose recruiters were HIV Negative (Abramovitz et al., 2009). The yield for the HIV-positive seeds for this study was 8% and 4.1% among subjects referred by high-risk HIV-negative seeds. Overall, the yield was better among the peer educators at 14.8%.

The study found a significant association between the type of relationship and HIV case identification. Specifically, HIV case identification was more effective among peer educators compared to other types of relationships. This suggests that the structured role and leadership position of peer educators may contribute to more efficient identification and referral processes. Furthermore, the seeds were grouped into four age categories: less than 20 years, 21-30 years, 31-40 years, and above 40 years. An association was found between age groups and PrEP linkage rates, with the under-20 age group exhibiting the highest linkage rate at 71%. However, no significant association was observed between age groups and other key outcomes, such as HIV case identification, linkage to ART, and continuity in PrEP or ART.

Leveraging different types of relationships and age-specific strategies in HIV prevention efforts is critical. Engaging young female sex workers to mobilize their peers for PrEP

initiation could significantly enhance uptake rates, utilizing the power of peer influence and intimate connections. This tailored approach underscores the need for targeted interventions to address the unique dynamics within different age groups and relationship types, ultimately improving HIV prevention and treatment outcomes.

5.2.3 The type of relationship between the seed and the peer to PrEP and ART linkage and subsequent continuity on the same.

The study established that the type of relationship between the seed and the peer significantly influenced PrEP linkage. Specifically, the relationship dynamics played a crucial role in determining the effectiveness of PrEP referrals. Peer educators, who act as liaisons between health facilities and peers, generally have fewer intimate relationships with their peers compared to HIV-negative and HIV-positive seeds, who often refer friends with whom they have close, personal connections. These intimate relationships can foster trust and open communication about HIV and other health issues, enhancing the likelihood of successful PrEP referrals.

In addition to the type of relationship, the age group of the peer was also significantly associated with PrEP linkage. The study categorized seeds into four age groups: less than 20 years, 21-30 years, 31-40 years, and above 40 years. It was found that the under-20 age group exhibited the highest PrEP linkage rate at 71%. This suggests that younger individuals may be more receptive to PrEP initiation, potentially due to peer influence and targeted outreach strategies that resonate more effectively with this demographic. However, the study found no significant association between the type of relationship and other key outcomes, such as ART linkage, PrEP continuation, or ART continuation. This indicates that while relationship dynamics and age significantly impact initial PrEP linkage, they do not necessarily influence the long-term continuation of PrEP or ART services.

These findings highlight the critical role of tailored interventions in HIV prevention efforts. Engaging young female sex workers to mobilize their peers for PrEP initiation could significantly enhance uptake rates, leveraging the power of peer influence and intimate

connections. It has been demonstrated that peer-led interventions increase acceptance of PrEP , and that peer support is “more trustworthy” and less abstract (Grenfell et al., 2022). Moreover, targeted strategies focusing on younger age groups may yield higher success rates in PrEP linkage. Understanding and utilizing these dynamics can improve the effectiveness of HIV prevention and treatment programs, addressing the unique needs and behaviors of different demographics and relationship types.

5.3 Conclusions

The structure of peer-to-peer relationships is based on structural equivalence, which refers to the similarities among network members and the strength of their relationships. The study found that linkage to PrEP was significantly better among social network members referred by their peers, demonstrating the effectiveness of these strong, equivalent relationships in facilitating PrEP initiation. Conversely, the relationship between peer educators and their social network members operates on a network-weighted mechanism of influence. In this structure, the influence of the peer educator stems from their leadership role within the network. Peer educators leverage their authority and trust within the group to encourage health-related behaviors. This dynamic was particularly effective in HIV case identification, with peer educators achieving a yield of 14.8% compared to 5% among peers. Peer educators had three times higher odds of identifying an HIV-positive individual, highlighting their pivotal role in HIV detection.

The study also found that peers within the under-20 age group had a positive influence on PrEP linkage. Younger peers were more successful in linking their social network members for PrEP initiation, suggesting that age-specific strategies can enhance PrEP uptake. This finding underscores the importance of leveraging the influence of young peers in HIV prevention efforts.

However, the study did not find any association between the type of relationship and other key outcomes, such as continuation on PrEP, linkage to ART, or retention on ART. This suggests that while the initial referral and linkage processes are influenced by relationship dynamics and age, the long-term continuation and retention in treatment are governed by different factors. The study highlights the importance of understanding and leveraging

different relationship structures in HIV prevention and treatment. Peer-to-peer relationships, characterized by structural equivalence, are particularly effective in PrEP linkage, especially among younger individuals. Meanwhile, peer educators play a crucial role in HIV case identification due to their network-weighted influence. Tailored interventions that consider these dynamics can significantly improve the effectiveness of HIV prevention and treatment programs.

5.4 Recommendations

5.4.1 Recommendations for implementers

Programs that work with key and vulnerable populations may want to consider using risk social networks for recruitment, to meet the Sustainable Development Goals of guaranteeing equity by "leaving no one behind".

Engaging peers beyond just peer educators is crucial for scaling up PrEP (pre-exposure prophylaxis) among female sex workers, especially the younger ones who are often hard to reach. Additionally, it is essential to target hidden female sex workers who do not typically frequent traditional hotspots. Peer educators, when given regular training, excel in identifying high-risk individuals, leading to a higher yield of new HIV cases detected. However, working with peers in a broader sense also significantly enhances the identification of new HIV cases. This expanded strategy is critical in addressing the challenge of reaching the hidden population. These individuals are often disconnected from the traditional outreach models and can only be effectively linked to healthcare services through their peers.

The importance of peer engagement cannot be overstated. Young and hidden female sex workers often lack access to conventional healthcare services due to various barriers, including stigma, discrimination, and mobility. Peer-driven approaches leverage the trust and rapport within these communities, facilitating better communication and a more profound understanding of the unique challenges faced by these women. By involving peers who share similar experiences, the initiative can ensure a more inclusive and comprehensive approach to HIV prevention. Moreover, the training of peer educators should be continuous and adaptive, addressing emerging trends and behaviors within these

populations. This dynamic approach not only improves the accuracy of identifying high-risk individuals but also enhances the overall effectiveness of the intervention. The integration of peers into the outreach strategy not only boosts the detection of new HIV cases but also fosters a supportive environment where female sex workers feel safe and empowered to seek necessary health services.

Expanding peer engagement beyond traditional peer educators is vital for the effective scale-up of PrEP among female sex workers. This strategy bridges the gap for hidden populations and ensures that high-risk individuals receive the care and support they need.

5.4.2 Recommendations for policy makers

Social network targeting might be especially helpful in situations where resources are scarce. Without expanding the number of people targeted or the expenses incurred, it might promote the adoption and spread of health interventions, enhancing population health(D. A. Kim et al., 2015).

5.4.3 Recommendation for researchers

Various mechanisms of social influence contribute to homogeneity in terms of behaviour change adoption and persistence. There is probably no single mechanism of influence that is optimal for all interventions. For instance, multiple social encounters may be necessary to reinforce deeper behavioural changes, either because they call for a large amount of motivation or because they involve a shift in long-standing behaviours and beliefs. Future research should focus on determining which pathway of influence is most beneficial for certain interventions.

5.5 Areas for further studies

An explorative study to establish the strength of the relationship between the social network members may shed more light on the outcomes observed. This may even address the sub-optimal retention for female sex workers linked to ART at one-year follow-up.

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APPENDICES

APPENDIX I: DATA EXTRACTION FORM

Information about the seed/recruiter

NO	Indicator	CODING CATEGORY	SKIP
101	Checklist number	101, 102,103, 104 …..	
102	Sub County	1. Dagoretti North 2. Dagoretti South 3. Embakasi North 4. Embakasi South 5. Embakasi West 6. Kamukunji 7. Langata 8. Roysambu 9. Starehe	
103	Facility	1. Kware Dispensary 2. SWOP City 3. Nairobi Deaf 4. Pumwani Majengo SWOP 5. Sokoni Arcade 6. SWOP Donholm 7. SWOP Thika 8. SWOP Kawangware 9. BHESP Roysambu 10. SWOP Kibra 11. SWOP Kariobangi 12.BHESP Kariobangi DIC	
104	Unique patient number of the seed		
105	Type of seed	1. Peer Educator 2. Newly Diagnosed HIV positive 3. High Risk Negative	

106	Confirmed HIV status	1. Negative 2. Positive	
107	Age in absolute number	Age in completed years	
108	Number of social network members line listed/elicited		

Information about the social contacts/social network member

NO	Indicator	CODING CATEGORY	SKIP
201	Unique patient number of the social network		
202	Age of the social network member in absolute number	Age in completed years	
203	Social network member established Known HIV Positive	0. Yes 1. No	1 skip to 204
204	Social network member HIV test result	1. Negative 2. Positive 3. Indeterminate	2 skip to 207
205	Social network member with a negative HIV test result document linkage to PrEP	1. Linked 2. Not linked	
206	Document 1 year follow up or retention on the program (check from Kenya Eelectronic Medical Record (EMR))	1. Active 2. LTFU 3. Transfer Out 4. Dead 5. Stopped sex work	
207	Linked to ART (check Kenya EMR)	0. Yes 1. No	
208	Social network member viral load results in copies/ml (1st sample taken) (check Kenya EMR)		
209	Social network member retention on ART (continuity in treatment status at 1 year) – check from Kenya EMR	1.Active 2.Transferred Out 3.Interrupted Treatment (Lost to Follow Up) 4. Dead 5. Stop ART	

APPENDIX II: WORK PLAN

The work plan covers the period from September 2023 to May2024

	Sept	Oct-Dec	Jan	Feb	Mar	April	May
Develop study topic							
Draft thesis proposal							
Proposal Defense							
Send the proposal to IREC							
Data collection							
Data analysis							
Mock defence							

APPENDIX III: BUDGET

ITEM	QUANTITY	UNIT PRICE	TOTAL
Pens	6	20	**120**
Pencils/rubber	6	10	**600**
Photocopying and printing	1	5000	**5000**
Box file	2	100	**200**
Proposal Booklet	1	3000	**3000**
Data Clerks	6	20,000	**120,000**
Total			**128,920**

APPENDIX IV: INTRODUCTION LETTER

Ole Sangale Rd, Madaraka Estate,
P.O Box 59857-00200, Nairobi, Kenya.
Cell: +254 703 414/6/7, Twitter: @SBSKenya
Email: info@sbs.ac.ke or visit www.sbs.strathmore.edu

Strathmore UNIVERSITY
BUSINESS SCHOOL

Tuesday, 21st May 2024.

To Whom It May Concern,

RE: FACILITATION OF RESEARCH – YUVINE AMONDI OTIENO

This is to introduce Yuvine Amondi Otieno, a Master of Business Management in Healthcare Management (MBA-HCM) student at Strathmore University Business School, admission number MBA HCM/148803/22.

As part of our MBA-HCM Program, Yuvine is expected to do applied research and undertake a project. This partially fulfills the requirements of the MBA-HCM course; to this effect, she would like to request appropriate data from your organization.

Yuvine is undertaking a research paper on "***An Examination of the Influence of Social Network Characteristics on Access to HIV Preventive and Curative Services Among Female Sex Workers in Nairobi***" The information obtained shall be treated confidentially and used for academic purposes only.

Our MBA-HCM Programme seeks to establish links with industry, and one of these ways is by directing our research to areas that would be of direct use to the industry. We would be glad to share our findings with you after the research, and we trust that you will find them of great interest and practical value to your organization.

We appreciate your support and will be willing to provide further information if required.

Yours sincerely,

Alois Njenga.
Manager – Graduate Programme.

APPENDIX V: ISERC LETTER

Strathmore UNIVERSITY

20th May 2024

Ms Otieno Yuvine,
yuvine.otieno@strathmore.edu

Dear Ms Otieno,

RE: An Examination of the Influence of Social Network Characteristics on Access to HIV Preventive and Curative Services among Female Sex Workers in Nairobi

This is to inform you that SU-ISERC has reviewed and **approved** your above **SU-masters** proposal. Your application reference number is **SU-ISERC2242/24.** The approval period is from **20th May 2024 to 19th May 2025.**
This approval is subject to compliance with the following requirements:

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

Before commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology, and Innovation (NACOSTI) https://research-portal.nacosti.go.ke/ and obtain other clearances needed.

Yours sincerely,

Mr Ambrose Rachier,
Chairperson; SU-ISERC

Ole Sangale Rd, Madaraka Estate. PO Box 59857-00200, Nairobi, Kenya. Tel +254 (0)703 034000
Email admissions@strathmore.edu www.strathmore.edu

APPENDIX VI: NACOSTI PERMIT

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **753412**

Date of Issue: **29/May/2024**

RESEARCH LICENSE

This is to Certify that Ms.. Yuvine Amondi Oticno of Strathmore University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: An Examination of the Influence of Social Network Characteristics on Access to HIV Preventive and Curative Services among Female Sex Workers in Nairobi for the period ending : 29/May/2025.

License No: **NACOSTI/P/24/36294**

753412

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.

See overleaf for conditions