Pre-Exposure Prophylaxis Use among Female Sex Workers in Dar es Salaam, Tanzania: a Mixed-Methods Study

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Abbreviations

AIDS	Acquired Immunodeficiency Syndrome
ART	Antiretroviral Treatment
AUDIT	Alcohol Use Disorders Identification Test
FSW	Female Sex Workers
HAART	Highly Active Antiretroviral Therapy
HIV	Human Immunodeficiency Virus
LMIC	Low-and Middle Income Countries
MoHCDEC	Ministry of Health, Community Development, Gender, Elderly and Children, Tanzania
MoH	Ministry of Health, Tanzania
MUHAS	Muhimbili University of Health and Allied Sciences
NACP	National AIDS Control Programme
PEPFAR	U.S President's Emergency Plan for AIDS Relief
PrEP	Pre-exposure Prophylaxis
RDS	Respondent Driven Sampling
STD	Sexually Transmitted Disease
STI	Sexually Transmitted Infection
TACAIDS	The Tanzanian Commission for AIDS
TSD	Tjenester for Sensitive Data (Services for Sensitive Data)
TSh	Tanzanian Shillings
UiO	University of Oslo
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNICEF	The United Nations International Children's Emergency Fund
USD	U.S dollars
WHO	World Health Organization
ZAC	Zanzibar AIDS Commission

Abstract

Pre-exposure prophylaxis (PrEP) is a HIV prevention tool that is highly effective when taken as prescribed, and the World Health Organization (WHO) has since 2015 recommended PrEP as a daily pill to female sex workers due to their disproportionate risk of HIV. However, studies and real-life implementation in different contexts have seen challenges with suboptimal adherence to pill taking and disengagement from services. In Tanzania, PrEP roll out started in 2021, with female sex workers being one of the priority groups. This thesis aims to provide evidence on PrEP usage, including perceptions and experiences with PrEP, and estimate disengagement with services and potential influencing factors, including harmful alcohol use, among female sex workers in Dar es Salaam, where 15% of female sex workers are living with HIV. The aspiration is that knowledge derived from this study can be able to inform programs and suggest ways to improve HIV prevention efforts in the country.

The mixed-methods study presented in this doctoral thesis is a part of a larger "mother study", "Pragmatic Trial for Pre-exposure Prophylaxis" (PREPTA), which supported the roll-out of PrEP among female sex workers and men who have sex with men. Data used in this doctoral thesis was collected between January 2021 and February 2022 in Dar es Salaam and comprised of both quantitative survey data and qualitative data based on in-depth interviews. The quantitative survey data was collected between March and July 2021 when a total of 470 HIV negative female sex workers were recruited to the "mother study" through respondent driven sampling (RDS) and initiated PrEP through a collaborating clinic. They were further registered if they attended the first follow-up (+56 days after enrolment). We used descriptive statistics and multivariable logistic regression models with marginal standardization to estimate proportions and associated factors, respectively. A total of 46 in-depth interviews with 40 female sex workers whom had either considered starting, was using or had stopped PrEP, were conducted, and analysis was conducted based on reflexive thematic analysis and critical public health theory as theoretical aspiration. The study has been informed by a socio-ecological approach which acknowledges that HIV risk and prevention practices are influenced by factors operating on several levels, from the micro/individual to the macro/structural.

Paper I presents quantitative findings from baseline where we examined harmful alcohol use, which has been suggested to influence the use of PrEP. Findings revealed that the estimated proportion of harmful alcohol use was high (37.3%), and that this was associated with socio-structural risks: gender-based violence (GBV) (adjusted prevalence ratio (aPR) =1.31),

mobility for sex work (aPR=1.36) and arrest/incarceration (aPR=1.55). In paper II, we estimated the proportion of female sex workers who disengaged early from PrEP services, which was also high, at 74.6%. Mental distress was significantly associated with early disengagement (adjusted relative risk (aRR) =1.14), while female sex workers with 10-29 clients/month had aRR=0.87 of disengagement, and those with >30 clients had an aRR=0.80 of disengagement, compared to women with less than 10 clients/month. Older age was also a protective factor of disengagement (aRR=0.75 for women ≥35, compared to women between 18-25 years). Harmful alcohol use was not significantly associated with disengagement (aRR=1.02). Paper III presents the qualitative analysis where we found that PrEP had diverse and multiple effects, which we referred to as the "effectosphere" of PrEP. Findings were organized under four central themes: 1. PrEP could promote human flourishing and empowerment 2. PrEP could inflict physical harm (and fears of such harms). 3. PrEP could expose sensitive information about HIV status and work and could lead to stigma. 4. PrEP could medicalize HIV prevention through the requirement of daily pill taking, regular follow-up visits, side-effects, and reliance on the medication.

The findings of this study resonate with studies conducted in other contexts, showing high disengagement with PrEP services, and socio-structural risk factors for HIV among users to be highly prevalent. Findings also illuminate that, although disengagement was high, PrEP could promote human flourishing and empowerment, while at the same time exert more challenging effects (such as anticipated bodily harm, stigma, relationship troubles). These self-perceived effects, together with the quantitative findings on mental health, age and having less clients being associated factors, might explain some of the high disengagement seen in this study. Although the disengagement was high, other studies have shown that there is more variability in user patterns than typical quantitative indicators can capture, and that many who do stop, at some point re-start PrEP. This taken together with our qualitative findings indicate that despite high early disengagement, PrEP can still be a relevant HIV prevention for female sex workers. To enhance this relevance, PrEP should engage with the social circumstances of users, and holistic integrated approaches to HIV prevention must be created with and for sex-workers. This should further take into account the women's complex life and work-circumstances, which involves skewed power- and gender dynamics and economic struggles.

Sammendrag

Pre-eksposisjonsprofylakse (PrEP) mot HIV er en medisin som er svært effektiv når den tas som forskrevet, og Verdens Helseorganisasjon har siden 2015 anbefalt PrEP for kvinnelige sexarbeidere med bakgrunn i forhøyet HIV risiko. Likevel har studier og implementering i klinisk praksis sett utfordringer med etterlevelse av daglig tablettinntak og oppmøte til oppfølgingskonsultasjoner. Tanzania begynte i 2021 å tilby PrEP til kvinnelige sexarbeidere som en av de prioriterte gruppene. Denne doktoravhandlingen har som mål å presentere forskningsbasert kunnskap omhandlende bruk av PrEP blant kvinnelige sexarbeidere i Dar es Salaam, en by hvor 15 prosent av disse lever med HIV. Dette omfatter betraktninger om og opplevelser kvinnene hadde med medisinen, og å estimere andelen som ikke møtte til første oppfølgingskonsultasjon og mulige påvirkende faktorer for dette, inkludert skadelig bruk av alkohol. Det langsiktige målet er at denne studien kan bidra til å bedre HIV programmer og forebyggingstilbud for HIV i Tanzania.

Denne metodetriangulerende («mixed-methods») studien er en del av en større studie "Pragmatic Trial for Pre-exposure Prophylaxis" (PREPTA) gjennomført blant kvinnelige sexarbeidere og menn som har sex med menn i Tanzania. Data brukt i denne doktoravhandlingen ble innhentet mellom januar 2021 og februar 2022 i Dar es Salaam, og består av både kvantitativ spørreskjemadata og kvalitative data basert på dybdeintervjuer. Spørreskjemaundersøkelsen ble gjennomført mellom mars og juli 2021 da 470 HIV negative kvinnelige sexarbeidere ble rekruttert til PREPTA ved bruk av deltaker-drevet rekruttering («respondent driven sampling»). Det ble videre registrert om de møtte til den første oppfølgingskonsultasjonen, dvs. innen 56 dager fra inklusjon i studien. Vi brukte deskriptiv statistikk og multivariable logistiske regresjonsmodeller med marginal standardisering for å estimere prevalens av to utfall: skadelig alkoholbruk og manglende oppmøte til første kontroll, og faktorer assosiert med disse utfallene. Det ble videre gjennomført totalt 46 dybdeintervjuer med 40 kvinnelige sexarbeidere som vurderte oppstart av PrEP, hadde startet bruk eller stoppet bruk av PrEP. Disse intervjuene ble analysert ved bruk av refleksiv tematisk analyse og kritiske teorier innen folkehelse og samfunnsmedisin. Studien har sitt fundament innen en sosio-økologisk modell som anerkjenner at HIV risiko og forebyggings praksiser blir påvirket av faktorer som opererer på ulike nivåer, fra mikro/individ-nivået til et makro/strukturelt nivå.

Artikkel I presenterer kvantitative funn fra spørreskjemaundersøkelsen hvor vi undersøkte skadelig alkoholbruk, en faktor som er antatt å kunne påvirke etterlevelse av PrEP. Vi fant at

andelen med skadelig alkoholbruk var høy (37.3%), og var assosiert med sosio-strukturelle risikofaktorer som å ha vært utsatt for vold (justert prevalensratio (aPR)=1.31), mobilitet i forbindelse med sexarbeid (aPR=1.36), og arrestasjon (aPR=1.55). I artikkel II estimerte vi andelen kvinnelige sexarbeidere som ikke møtte til første oppfølgingskonsultasjon i PrEP programmet. Denne var høy (74.6%). Faktorer assosiert med ikke-oppmøte var å ha rapportert psykiske plager (justert relativ risiko (aRR)=1.14). I tillegg hadde kvinner med 10-29 klienter/måned og kvinner med >30 klienter/måned henholdsvis en aRR på 0.87 og 0.80, sammenliknet med kvinner som hadde færre enn 10 klienter. Høyere alder var en beskyttende faktor og ga lavere risiko for ikke-oppmøte med en aRR på 0.75 for kvinner>35 år sammenliknet med kvinner 18-25 år. Vi fant ikke evidens for at skadelig alkoholbruk var assosiert med ikke-oppmøte (aRR=1.02). Artikkel III presenterte den kvalitative analysen hvor vi fant at PrEP hadde multiple og mangfoldige effekter, som vi refererte til som «effektosfæren» til PrEP. Funnene ble organisert under fire sentrale tema: 1. PrEP kunne promotere «menneskelig blomstring» («human flourishing») og myndiggjøring (empowerment), 2. PrEP kunne skade (eller føre til frykt for skade), 3. PrEP kunne eksponere sensitiv informasjon, og 4. PrEP kunne medikalisere livet eksemplifisert gjennom nødvendighet av daglig medisininntak, regelmessige oppfølgingskonsultasjoner, bivirkninger og en bundethet til medisinen.

Disse funnene samsvarer med studier fra andre kontekster, som viser at en høy andel ikke møter til oppfølgingskonsultasjonene i PrEP program, og i tillegg at sosio-strukturelle risikofaktorer er høyprevalent blant brukerne. Funnene viser også at til tross for lavt oppmøte, kunne PrEP promotere menneskelig blomstring og myndiggjøring, sammen med mer utfordrende effekter (som kroppsubehag og frykt for skade, stigma, relasjonelle utfordringer og avhengighet av et medisinsk system). Disse opplevde effektene, sett sammen med de kvantitative assosierte faktorene som psykiske plager, yngre alder og færre kunder, kan sannsynligvis delvis forklare den høye andelen kvinner som ikke møtte til første oppfølgingskonsultasjon. Til tross for at denne andelen var høy, har andre studier vist at det er mer variabilitet i bruksmønster av PrEP, enn typiske kvantitative indikatorer kan fange opp, og at mange av de som stopper bruken av PrEP, begynner å bruke medisinen igjen senere. Disse funnene sett i sammenheng med de kvalitative funnene i vår studie, viser at PrEP fortsatt kan være relevant HIV prevensjon for sexarbeidere. For å øke denne relevansen, må PrEP virke sammen med brukernes sosiale omstendigheter. Helhetlige integrerte strategier for HIV prevensjon må utvikles for og sammen

med sexarbeiderne selv. Disse strategiene bør videre hensynta kompleksiteten i kvinnenes liv og arbeid, som inkluderer ujevne kjønns -og maktforhold og økonomiske utfordringer.

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If you want to go fast, go alone. If you want to go far, go together.

African Proverb

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List of Papers

Paper I

Harmful Alcohol Use and Associated Socio-Structural Factors among Female Sex Workers Initiating HIV Pre-Exposure Prophylaxis in Dar es Salaam, Tanzania

Lichtwarck HO, Kazaura MR, Moen K, Mmbaga EJ. International Journal of Environmental Research and Public Health. 2022 Dec 30;20(1):698

Paper II

Early disengagement from HIV pre-exposure prophylaxis services and associated factors among female sex workers in Dar es Salaam, Tanzania: a socioecological approach.

Lichtwarck HO, Mbotwa CH, Kazaura MR, Moen K, Mmbaga EJ. BMJ Global Health. 2023 Dec 28;8(12):e013662.

Paper III

What can PrEP do for female sex workers? Unpacking the "effectosphere" of biomedical HIV prevention in Dar es Salaam

Lichtwarck HO, Massawe PM, Mmbaga EJ, Moen K. Submit to Social Science & Medicine Feb 2024

1.0 Introduction

Despite great advances in the last couple of decades, an estimated 39 million people live with HIV, 1.3 million people acquired the virus and 630 000 lost their life to the disease in 2022 (1). HIV continues to disproportionally affect key populations, who account for about half of all new HIV infections in Sub-Saharan Africa, a region which is home to two-thirds of people living with HIV (2). One of these key populations, groups that have a disproportionate burden of HIV in many settings (3), are female sex workers who are 30 times more likely to acquire HIV than other adult females (2). This disproportionate risk can be linked to factors situated at the individual, interpersonal, community, institutional and structural levels, including, but not limited to stigma, criminalization, sex-work related mobility, unequal access to services, violence, multiple partnerships, gendered power dynamics and suboptimal condom use (4), and requires actions that takes these complex influences into account (4).

In Tanzania, the HIV prevalence among the estimated 155,450 female sex workers was 26 % in 2014 (5). The 2017 bio-behavioral survey (6), has indicated declining prevalence, and in Dar es Salaam, the country's largest city, the prevalence is estimated at 15% (6). Notwithstanding the great achievements Tanzania has seen in recent years, female sex workers are still unequally affected by HIV, as the corresponding prevalence in the general population is estimated at 4.4 % (7). Addressing this inequity has the potential to not only benefit female sex workers, but also have a considerable impact on the rest of the population, as the country transitions from a generalized epidemic to more concentrated epidemics among key populations.

One approach to promote equitable outcomes for female sex workers is to ensure access to prevention services and address the circumstances that might hinder their utilization. Much expectation has been put into the advances of *biomedical tools*, such as pre-exposure prophylaxis (PrEP), to curb infection rates among female sex workers. PrEP, taken as a daily pill, has been found highly effective in clinical trials and is now recommended as part of a comprehensive prevention package by WHO (3) and in Tanzania (8). However, PrEP rollout has been slower than anticipated, and there is insufficient access for those who might stand to benefit (1). Additionally, programs in different contexts have encountered challenges with suboptimal adherence and lower engagement levels than anticipated by the biomedical community (1).

This study was conceptualized as part of a larger study: "Pragmatic Trial for HIV Pre-exposure prophylaxis Roll-Out in Tanzania" (PREPTA), in the following also referred to as the "mother-

study, which carried out various research aiming to support the roll-out of HIV pre-exposure prophylaxis among two key population groups in Tanzania: female sex workers and men who have sex with men. PrEP implementation among key populations was still in an early phase in Tanzania when research started. It was seen as imperative to investigate engagement in care, how PrEP was perceived and experienced by users, and contribute with evidence on social and behavioural factors known to be linked to HIV risk within this group and engagement in care, which is what this thesis aims to do. The findings can be used to provide recommendations on possible actions to improve health programs and social circumstances for female sex workers. It is also my hope that this thesis will provide a contribution to female sex workers' wellbeing, as well as their families and sexual partners, and the country as a whole by promoting more equitable health outcomes. Furthermore, on a global scale, this study adds new and valuable evidence on PrEP among female sex workers, addressing a currently limited area of research.

Before the commencement of this project, national authorities had already expressed their interest in research related to key populations and HIV management and prevention. Therefore, the project was not only timely but also aligned with the current policy goals and priorities (9). Internationally, the study is aligned with WHO recommendation for HIV prevention among high-risk populations (3) and the global overarching goal of "ending the AIDS epidemic" by the year 2030 (10), and the UNAIDS strategy 2021-2026: "End Inequalities. End AIDS" (11).

2.0 Background

2.1 The HIV epidemic globally and in Sub-Saharan Africa

Human immuno deficiency virus (HIV), and the associated disease: Acquired Immune deficiency syndrome (AIDS), has since the early days of the epidemic in the 1980s become a condition associated with "social unacceptable behaviour" (12), as the virus spreads through bodily fluids by unprotected sexual contact or blood by needle sharing (13). It came to be the disease of the "gay" in Western societies, but has also been associated with immigrants, injecting drug users, sex workers and populations in African countries (13, 14).

Until the mid-90s there were only limited treatment options and HIV was in effect a death-sentence (15). In 1996 the major biomedical breakthrough came with *HAART*, highly active antiretroviral therapy, a triple-drug therapy that worked much better than the first line of medications, as it included a new drug class "protease-inhibitors" (16). Together with the older drugs, it lead to stark drop in viral load (15). A new era of fight for drugs started, where new therapeutic citizenships emerged within what has been coined "confessional technologies" as one way to gain access to drugs (17). The new drugs were far from perfect though, and side-effects were for many tough and daily dosing challenging (15). Despite claims that the drug would be too complex to administer in low-resource settings (and thus should not be prioritized), evidence showed that high adherence was possible (16). Battles between HIV activists, national governments and the pharmaceutical industry, so called "big pharma" further took hold as costs of drugs were too high and made them largely inaccessible, consequently leading to generic production of patented drugs (16). "Big pharma" then took countries to court, but international push and pressure from grass rot movements finally contributed to withdrawal of these lawsuits (16). These movements also shaped the landscape of HIV/AIDS consolidating a disease that embodied more than biology (17, 18). These struggles echoed colonial dominance and local resistance, and even shaped the emerging landscape of global health (16).

In 2000, HIV as the first disease was declared a security threat by the UN security Council (19), and the same year the "Millennium Development Goals" set the tone for continued intense efforts to "combat HIV" with two targets as part of goal 6 focused on HIV (20). These aimed to ensure universal access to treatment by 2010 and to halt and begin to reverse the spread of HIV by 2015 (20). In the years after the millennium, there were broad commitments from African states to increase budget spending on the health sector and donor initiatives and foreign

spending multiplied (16, 19). This has been coined the era of "AIDS exceptionalism" as HIV/Aids came to see an exceptional status in terms of funding and budget priorities compared to other poverty-related issues (21). Among those with most muscle, in terms of funding, was "The Global Fund to fight AIDS, Tuberculosis and Malaria" (GAVI), and "The United States President's Emergency Plan for AIDS Relief" (PEPFAR) (16). The latter committed 15 billion dollars to be paid over five years, the largest commitment of funding to any single disease in history (19).

Collective action by affected communities, groups or networks of people have since the epidemic begun been instrumental in the AIDS response (22, 23). One example is highlighted above in relation to advocating for access to drugs, but they have also been at the centre stage when it comes to transforming sexual and drug injecting practices to protect themselves and others (22). For instance, in Australia gay communities reduced HIV risk through the adoption of safer sexual practices, which included condom use, serosorting (unprotected sex with a partner with the same HIV status as oneself), reliance on undetectable viral load, strategic positioning (receptive or insertive depending on HIV status) among others. Sex work collectives have similarly been able to reduce HIV risk through collective action (24).

Overall the multitude of efforts had an effect, and by 2013, the number of newly infected had been estimated to drop to 2.1 million people, from 3.4 million in 2001 (20). Substantially more people with HIV infection were on treatment, an estimated 12.9 million people, with 11.7 residing in low-and middle income countries (20). However, the number of people living with HIV in the same countries were 32.6.millon (20). Due to the effect of HAART, a substantial number of people who earlier would have died from the disease, survived, indeed morality rates have dropped substantially (20). The prevalence, the total population living with HIV today, is however still high, at 39 million (1) reflecting both better survival and insufficient declines in incidence rates in several regions.

The Sustainable Development Goals (SDGs) (25) that followed the Millennium Development Goals, incorporated an arguably more comprehensive focus than its predecessor. HIV was highlighted under goal 3 "Health for All", with the aim of ending the epidemic of HIV/Aids by 2030 (26). This meant a decline in the incidence (number of newly infected) and deaths attributed to HIV by 90% from 2010 to 2030 (26). The "90-90-90" target soon followed: 90% of people living with HIV (PLHIV) knowing their HIV status, 90% of those accessing treatment, and 90% of those again having undetectable viral load (26) by 2025 (which later has

become the 95-95-95 targets) (1). Even before Covid-19 hit, there were scepticism relating to if these target could be met (26), and after the Covid-pandemic, with health programs and social systems disrupted and a global economy impacting spending on health (27), this might prove even more difficult. However, there are uplifting evidence showing that several countries have had great progress, including the country of focus in this body of work, Tanzania (1).

By 2022, 39 million people are living with HIV. An estimated 29.8 million are on treatment, an almost fourfold increase from 7.7 million in 2010 (1). UNAIDS highlights that in eastern and southern regions of Africa where investments have been high, is also where progress has been the strongest (1). New HIV infections have dropped by 57% since the 2010 level, with the number of new HIV infections (1.3 million) being the lowest in decades (1). Several countries, including Tanzania, and have already or are close to achieving the "95-95-95 targets" (1).

The world has in other words seen tremendous progress fighting the HIV epidemic. This progress however, has been unevenly distributed. Regions such as Eastern Europe, Central Asia, the Middle East and North Africa are seeing an increasing trend in HIV infections (1). There are also stark inequities within countries between different groups which will be presented in the following section (28).

2.1.1 Key populations, inequity and social drivers in the HIV epidemic

Heterosexual contact has been the main route of transmission in Sub-Saharan Africa (1), but some groups of people have historically and currently been more at risk of HIV. Defined by WHO, *key populations* are groups that have a disproportionate burden of HIV in many settings, including female sex workers, men who have sex with men, people who inject drugs, people in prisons and closed settings and transgender people (3). WHO have also placed special attention to *vulnerable populations* (3): populations that have vulnerability to HIV in certain settings or contexts, such as adolescent girls and young women in Sub-Saharan Africa (3).

Key populations face a higher risk of HIV, even in countries where the prevalence is generally high. Globally, compared to the rest of the population, female sex workers are estimated to have a prevalence four times higher, men who have sex with men 11 times higher, and people who inject drugs seven times higher (1). For instance did a review find a pooled prevalence of 28.6% for female sex workers in ten Sub-Saharan countries (29). Estimated HIV prevalence varies greatly between countries and even within countries for these groups, while there is also

a problem with underreporting of population estimates, with the biggest gaps among transgender people and people who inject drugs, and those coming from the Middle East and North Africa regions (1). To track the epidemic and progress, updated population estimates are vital. Mathematical models have indicated that between 14-38% of new HIV infections in Kenya, Burkina Faso and Benin could directly or indirectly be due to sex work, which also underscores the importance of epidemic dynamics for the rest of the population (30).

Inconsistent condom use is one proximal risk factor for HIV, and use also seems to vary widely between different key population groups and different contexts (1). For instance, has condom use at last sex among sex workers, been more than 90% in several countries, while sex workers in other countries have much lower reports, less than 50% (1). Their vulnerability to HIV is also influenced by societal and legal challenges, such as punitive laws, stigma and discrimination, which often also impedes access to services for both treatment and prevention (1). A recent multi-country study in Sub Saharan Africa for instance found that countries with punitive policies and legal barriers to same-sex relations had a 5 fold increased odds of HIV among men who have sex with men than those who did not have these policies (31). Another systematic review and meta-analysis of studies conducted among sex workers found that repressive policing was associated with unprotected sex (odds ratio (OR)= 1.42), HIV (OR=1.87) and sexual/physical violence (OR=2.99) (32).

Although there has been progress in some areas, with preliminary analysis of UNAIDs data indicating declining HIV incidence between 2010 and 2020 among sex workers, key population are still falling behind in the HIV response compared to other groups (1). For instance are key populations services typically underfunded (90% funding gap), stigma, discriminations and criminalization still impede access to services and increase HIV risk, PrEP coverage is low (estimated to 5%), programs are often not accessible, or sometimes even absent (1).

Traditionally, the HIV field have been occupied with risk, and then typically individual risk factors or *risk behaviours* (22). This fits well with biomedical reasoning and neoliberal models assuming that that individuals are rational beings that will act in a rational way, provided they just have enough information (22). Risk is typically understood as residing within individuals rather than environments (33). However, after decades of HIV, the recognition of social drivers in the HIV epidemic, and the need for a response that takes these into account have become more pronounced (34-37). Auberbach et al. (35) refers to social drivers as: “the core social processes and arrangements – reflective of social and cultural norms, values, networks,

structures and institutions - that operate around and in concert with individuals' behaviours and practices to influence HIV epidemics in particular settings" (35). In this thesis, the term social drivers is used interchangeably with *socio-structural factors, social determinants or structural determinants/factors*, which is often the case (35), acknowledging that some view the latter terms to put too much efforts on *outside* influences and fails to sufficiently encompass social action and collective efforts and agency (35). In the following use of these terms, the social agency and capacity that individuals as part of communities have to exert change are recognized.

A social drivers approach highlights that HIV is influenced by a complex nexus of factors. These range from individual and dyad practices to more distant influences related to social and structural contexts, such as poverty, discriminatory laws, stigma, gender norms, migration, violence etc. It recognizes that responses to HIV needs to include amending these as well to be effective, and not mainly focus on individual "risk behaviours" (4, 22, 35). A social drivers approach helps to understand why key populations in particular are vulnerable to HIV (4). Interestingly, modelling studies have indicated that socio-structural conditions do not necessarily operate in linear fashion, but depend on local environments and practices and can change with time. For instance, although poverty is regarded as a driver of the HIV epidemic, typically people from higher socio-economic strata and urban populations have been more at risk for HIV early in the epidemic in some Sub-Saharan countries (35). A modelling study including 124 low-and middle income countries (LMIC) has for instance shown how a non-enabling environment including stigma, discrimination and exclusion negatively affects HIV programming (38). To understand how socio-structural factors are connected to sexual practices or other practices that increase risk of HIV in a given setting, and how to intervene, there is a need for contextually relevant research, tailored interventions, community mobilization as well as policy change. This includes attention to the power imbalances that drive the epidemic and leads to inequities, both at local, national and global level (39).

Young people from key population groups, such as sex workers, are particularly affected by these power imbalances (1, 40), highlighting the importance of *intersectionality* when aiming to understand variation with regards to HIV vulnerability and use of prevention (1). Intersectionality refers to how individuals can embody a multitude of identities or positions in the society based on some definable characteristic, such as gender, age, sexuality, class, race etc., and that these intersect to produce differential outcomes and experiences (41). Only focusing on one such characteristic, such as being a sex worker, do not capture the complexity

of embodied experiences a person might encounter. Another example are women injecting drugs who also sometimes sell sex to sustain drug use, where both the female gender, drug use and sex work lead to heightened vulnerability, such as exposure to violence and unsafe sex. Sex workers who also inject drugs, for example has been found to have a much higher HIV prevalence than those who don't (42). Although referring to female sex workers, this research has been mindful of this complexity and the nuances and do not regard sex workers as a homogenous group.

Services for key populations that include the affected communities through participatory approaches and community activism, and that are people-centred are vital in the HIV response (23, 28, 43). This has been seen in different countries and for different groups, ranging from PrEP services for men who have sex with men in Australia (22), to prevention programmes run by sex workers themselves in India (24). Additionally, policy changes that lay the foundation for a more enabling environment for these groups would likely have much desired impact (1, 32, 44).

2.1.2 Sex workers, health and HIV

Prostitution, which traditionally has been the term used to refer to selling sex, is an old trade, dating all the way back to Mesopotamia 2000 B.C (45). Although researchers have debunked the "myth" that sex work is universal, something that has existed almost as a necessity in all societies to all times, evidence has illustrated that sex work indeed has been present in highly different contexts and historical times (45). One can in particular trace sex work as highly prevalent during phases of high population growth, urbanization, migration and economic transition, such as during the Roman Empire, in Japan in the 1700s, Western Europe during the 1800s, and South-east-Asia today (45).

Contemporary (heated) debates around sex work within sociology, criminology, political science, and among feminist scholars typically revolves around how sex work and female sex worker are perceived, and thus how it should be regulated or handled from a societal perspective (not discounting that sex workers indeed also can be men). These debates can be traced to different paradigms, as described by Weitzer (46). The "oppressive paradigm" views most or all sex workers as victims of sexual violence and sees sex work as inherently harmful, thus sex work should be criminalized and the women rescued (46). Proponents of this paradigm commonly use the word "prostitution" or "prostituted". On the diametrically opposite spectrum, within the contrasting "empowerment paradigm", sex work is framed as (potentially)

liberating, and as work, and thus what is needed is for sex workers rights to be acknowledged (46). Sex work is within this paradigm typically viewed as an economic transaction as any other. A more nuanced third paradigm proposed by Weitzer (46), "the polymorphous paradigm", emphasize the heterogeneous nature of sex work and sex workers, and argues that it is made up by a "constellation of occupational arrangements, power relations and worker experiences" (47).

As already exemplified through the writings so far, this body of work uses the term "female sex worker" to refer to women selling sex. "Sex work" is also the preferred term by sex workers and sex work organizations in heterogeneous settings (48, 49). Within public health and HIV literature, this term is now commonly used (44, 50). This should be understood in the light of the sex workers' movements globally experiencing increased support, by agencies such as UNAIDS and UN Women and other public health stakeholders, like "Human Rights Watch" and "Associations for Women's rights in development" (48). Even the influential medical journal "The Lancet" has through several articles and Lancet series in the last decade highlighted the needs for a structural determinants framework and a rights-based approach for sex workers to tackle their vulnerability to HIV, and studies have shown how legal and societal sanctions are detrimental to sex workers' health (44, 50).

Female sex workers are a diverse group of women (46, 51). They range from escorts to women in stark disadvantageous positions practicing "survival sex" (46). The lack of a sampling frame when researching sex workers, due to the stigmatized and criminalized nature of the trade, however means that it can be difficult to know what the most common experiences and characteristics of the women are. Research indicate that some types of sex work seem to expose women to more risk than others, such as street-based work where violence is more rampant (46). In in-door work such as work within brothels, bars, and massage parlors there might be others who can intervene in the event of violent customers (46). Sex work might also vary from one country and cultural setting to the next (49, 52, 53).

When assessing sex workers' health globally, there is evidence that they as a group experience higher rates of unfavourable health outcomes. Their increased risk of contracting HIV (30 times higher than other women) is already well established and that is why there has been an increased focus on this key population within the HIV epidemic. However, evidence also indicates that they have high rates of other sexually transmitted diseases (STDs), excessive alcohol use (54-57), other substance use (51, 55), and mental health issues (51), in addition to

the socio-structural factors already outlined in the section on "key populations". A recent systematic review of mental health challenges among female sex workers in low-and middle income countries (LMIC) found high prevalence of depression (41.8%), anxiety (21%), post-traumatic stress disorder (19.7%) and recent suicide attempt (6.3%) (58). Mental health (59) and substance use among this group, such as excessive use of alcohol, have however received limited attention despite their links to HIV (60), retention in HIV care (61) and not to mention their own particular effect on morbidity and mortality (60). The potential detrimental effects of injecting drug-use are well-known, however, the much more common substance alcohol can also lead to harmful physical consequences, through its effects on organ systems increasing risk of liver disease, cancers and cardio-vascular disease (60) and also carries the potential for dire mental and social effects. For instance, among female sex workers, excessive alcohol use has been found to be associated with condomless sex (62), more sexual partners (62), sexual assault or violence (62, 63), and even recent suicide (58). Studies indicate that alcohol use is common among female sex workers, and as commercial sex work often takes place in bars (54, 63), environmental influences are indeed present. Alcohol has also been found to play a role within the negotiating process with clients (54, 64).

A focus on the challenges that sex workers face should not obscure the presence of collective and individual agency that they also posit. A multitude of accounts points to this multiplicity being present, and that female sex workers indeed have the potential to change their situations through collective action despite hardships (48, 53, 65). Mgbako (48) has perhaps written the most detailed account of sex worker activism in Africa, including voices from Botswana, Kenya, Mauritius, Uganda, Namibia, South-Africa and Nigeria. She has through this work displayed the nuances of sex workers experiences and their struggle to have their voices heard (48). She also posits that in an unequal capitalist society where many women have limited economic opportunities, sex work can for many indeed be a rational decision (48). Another in-depth analysis of female sex workers' narratives in South Africa, illuminates how sex workers' lives are influenced by the discourses on sex work and especially the stigma associated with sex work, so much so that they themselves come to think of themselves as "dirty and shameful" (41). Through the analysis of these accounts which also describes rampant violence and other forms of degradation, the author distils the ways in which the women act against this domination of power, echoing resistance. The women acknowledge the gendered inequities, take measures to take care of their health, recognizes collective struggles with other sex workers, and they also resist what they regard as the shameful identity as a sex worker, through

positioning themselves as good mothers taking care of their children (41). Another paper based on two studies employing a participatory action research approach in South Africa (but with participants from different African countries) has further explored notions of feminism and sex work (49). It found that despite sex workers' description of sex work being seen as "immoral" in many African cultures, it was regarded as a form of livelihood by the participants and that their lived experiences typically did not speak to either anti-sex work or pro-sex work camps, but both sides (49).

Strategies for curbing infection rates among female sex workers, and ensuring better health and social circumstances demands actions on both individual, community and structural levels, (often coined combination prevention) tailored to local contexts, and should be conducted in close collaboration with sex worker communities themselves (66). This includes condom promotion and distribution, test and treat programs, biomedical approaches, combined with community-, social cohesion- and empowerment approaches (66). Especially community empowerment approaches where sex workers have collective ownership of programs and which seeks to tackle social and structural factors as well as individual, have been effective (1, 65, 67). There is also a need for integration of services other than for HIV, such as mental health, sexual health, and addiction services (59, 68). As previously highlighted structural level interventions also include decriminalization of sex work, stigma reduction strategies and not least ensuring access to services and safer work environments (50).

2.2 Pre-exposure prophylaxis

Together with developments such as "Treatment as Prevention" (TasP), and "Undetectable equals Untransmissible" (U=U), PrEP makes up an expanding "toolkit" of biomedical prevention (69). Already in the mid-2000s, studies were being conducted to test antiretroviral drugs efficacy in preventing HIV among people at high risk, not only as a treatment after infection. Some of these first studies were conducted among female sex workers in Cambodia and Cameroon (70). They received criticism relating to exploitation of participants and unethical conduct and were eventually shut down (70). After this, consultations by the WHO and UNAIDS to study the controversies and improve the conduct and proceedings of future studies followed (71). These proceedings focused on ensuring access to treatment and care, inclusion of community representations, and research literacy (70, 71). Several efficacy trials followed in the years between 2007 and 2013, and it was established that PrEP was indeed highly effective if taken as prescribed (72, 73). For instance, a systematic review of eighteen

studies showed that PrEP significantly reduced the risk of HIV compared to placebo (74), and mathematical modelling from the iPrex trial with men who have sex with men found that PrEP yielded 99% protection with high adherence (75). Trials among women however showed mixed results, and two trials with only female participants, namely the FEM-PrEP (76) and the VOICE (77) trials failed to show efficacy. It was established that adherence in these studies was very low, to a large extent explaining the findings. Subsequent analysis found that PrEP is effective in women when adherence is high (78, 79). Using adherence data from five trials that included women (including the FEM-PrEP, the VOICE and "Partners PrEP") showed that high levels of adherence, at >75%, defined as the proportion of participants with any concentration of TDF in the blood (except for the FEM-PrEP which used a higher threshold of 10 ng/ml) were protective (relative risk = 0.39, 95% confidence interval: 0.25-0.60) (79). Later analyses have also corroborated the high protection in women (80, 81). Qualitative findings from the VOICE trial highlighted that possible reasons for low adherence were related to the unknown efficiency of PrEP at the time, challenges and social risks connected to daily use, side-effects, and the medicine's affiliation to HIV, among other factors (82).

PrEP in pill formulations, was first approved by the U.S Food and Drug Administration in 2012 with WHO recommending PrEP as an additional prevention choice for some population groups the same year (3, 69). Updated guidelines from 2015 recommended PrEP to people "at substantial risk", rather than limiting it to specific populations (3). Substantial risk was defined as HIV incidence greater than 3 per 100 person years in the absence of PrEP (3). PrEP in its most common form consists of tenofovir disproxil fumerate (TDF) with or without emtricitabine (FTC), known through the brand name "Truvada", an HIV antiretroviral also used in HIV treatment regiments (3).

Studies have indicated that as low as 2 doses/week can yield sufficient protection for men, while women need higher adherence (≈ daily) to reach the necessary protection levels (80, 83), which may be attributed to differences in drug concentrations between rectal and vaginal tissue (84). While daily dosing is what is mostly recommended and prescribed (3), "on demand" dosing strategies also exist, specifically for men who have sex with men, where pills typically are taken before and after the sexual act (85).

PrEP is considered safe, with potential for few serious side-effects (subclinical declines in renal function and bone mineral density) (3). Few people on PrEP become HIV infected, but those who do have a risk of drug resistance, which might reduce HIV treatment options (86). Another

concern with PrEP has been so called “risk-compensation”; that the use of PrEP would lead to changes in behaviour counteracting the potential benefit, such as abandonment of condoms with implications for prevalence of sexually transmitted infections (STIs). Evidence on this is mixed (87-90). The earlier efficacy trials and demonstration studies did not find evidence of risk compensation, while a few open-label studies have, especially among men who have sex with men, where participants know they are taking effective drugs (88). Quaife et al. (88) argues that the potential effects of increasing STIs must be seen alongside the benefits of PrEP on reducing risk of HIV, and urges more evidence on the effect of risk compensation on a community level, including how users see PrEP as a complement and/or substitute for condoms (88).

PrEP initiations have increased markedly over the years, and by the third quarter of 2023, over 5.6 initiations were estimated, although this does not accurately reflect the number of those ever starting PrEP since there are possibilities for being counted more than once (91). UNAIDS however underlines that there are still large gaps in coverage, and expanded implementation of PrEP has been limited to a small number of countries (1). Particularly, there are large gaps among key and vulnerable populations in low-and middle-income countries in Asia and the Pacific, while Eastern- and Southern Africa on the other hand, has seen a marked increase in PrEP use (1).

Other PrEP modalities aside from oral PrEP have recently entered the marked (1). Much optimism is being put in the Cabotegravir injectable, for which WHO issued guidelines in 2022 (92, 93). Although studies suggest that users are 80% less likely to acquire HIV than those taking oral PrEP (92), pricing inequalities suggest that access might be a challenge (1). The Dapivarine vaginal ring is also approved as a prevention choice for women in Africa (94). Both these options are in early phases of expansion. Although the ring is not as efficient as oral PrEP taken as prescribed, adherence and retention with the ring has been found to be high (94), and roll-out has begun in a few countries (1). Oral PrEP is however still the most widely used formulation today and will likely be the main option for many people for many years to come.

2.2.1 The PrEP care continuum – with a particular focus on female sex workers

That any medicine has shown efficacy under controlled circumstances does not equate to real-life effectiveness (22, 95). This potential discrepancy is often referred to as the efficacy-effectiveness gap (95). For PrEP to be effective it needs to be taken up by those who might

benefit, and it needs to engage with the social circumstances so as to be integrated into everyday practice (36).

The "PrEP care continuum" (96) or "PrEP cascade" (97) has been used as an illustration of the different steps that makes up implementation progress. This includes (but is not limited to) awareness, acceptability, uptake, medication adherence, continuation/retention in care (96). There has been considerable discussion and variation with regards to how these items are measured, for instance, how should adherence to pills be measured, (i.e. objective plasma concentrations, pill count, electronic devices or self-report) (81, 98), and what is the best way to measure continued use (99). The terms "continuation" (97, 100, 101), "retention in care" (96, 102) "persistence" (100) and "engagement in care" (103-105) are typically used interchangeably and measured as attendance to follow-up visits (or reports of PrEP stoppage) and assumes continued PrEP use (99). Stopping PrEP can off course happen even if someone has showed up to a follow-up appointment (for instance due to provider initiated discontinuation), however most PrEP discontinuations are patient-driven, and typically done without consulting health care providers (100). In this thesis, the terms used will typically follow the original paper or study which is being referred to. Another discussion has centred around "prevention-effective adherence" as individuals taking PrEP are not necessarily always under "risk", and thus it would be important to measure that people are protected when they are actually under risk, though this is more complicated (106).

A review investigating how PrEP has changed sex pointed to several studies showing low awareness among female sex workers (107). It is however likely that awareness will increase as PrEP is being implemented within regular health systems and key population friendly clinics and not only available through trials and demonstration projects. Acceptability when examined in studies (typically defined as a hypothetical question or as de facto uptake of PrEP) also varies (103, 108), but has been reported to be high among sex workers, including in Tanzania (108-113).

A systematic review published in 2018, which included many of the earlier PrEP efficacy trials found considerable variation in adherence to PrEP (114). Implementation projects and newer studies among female sex workers also point to challenges with adherence: for instance did a study in Uganda find that 71% had protective adherence through pill count in week 1, however this had fallen to 50.4% by self-report the last 3 months (115). Another study in Benin, measured average adherence to be 26.8% with TDF concentration, 18.9% pill count and 56.0%

with self-report, concluding that the decrease in adherence was greater when TDF concentrations were measured, and indicated that self-report overestimated adherence (98).

Several studies on PrEP implementation, especially in low-resource settings, have found discontinuation of PrEP to be high (99, 116, 117). Two reviews that combined findings from implementation studies, real life settings and efficacy trials, have also found high discontinuation (99, 101). This indicates that counting number of initiators (uptake) is not a useful proxy for effectiveness (95). Of specific relevance for this thesis, several studies conducted among female sex workers in low-and middle income-country settings have seen low continuation rates. For instance in Benin the overall retention at the end of the study was 47.3% (118), while in a demonstration project in South Africa in two urban clinics, 53% of participants were seen at one month follow up with a drop to 22% at after 12 months (119). In Kenya, a demonstration project found that at one, three and six months 40.3%, 26.3% and 14%, respectively were engaged in care (120), while in the SAPPHIRE-trial of combination prevention in Zimbabwe, the HIV negative women who started PrEP (only 38%), PrEP was only used on average for 4 months (121). There are however studies that have had more success if this is defined by continuation criteria. In a demonstration trial in Senegal 90% of female sex workers were retained after month 1, and as many as 73.4% at month 12 (102).

A recent review by Haberer et.al (122) outlined challenges relating to access, initiation, adherence and continued use of PrEP globally. They pointed to issues of cost, provider reluctance, and distance to clinics, unfriendly services, and challenges for those who migrate for work or other reasons, and they highlight that access barriers hit hardest for those who live in rural areas and people who belong to marginalized communities (122). Stigma, criminalization, and discrimination are also barriers to access, especially for key populations groups, such as female sex workers (113). Challenges to adherence and continuation are complex and varied, and in addition to those seen for access, the review point to factors such as depression, substance use, side-effects, competing priorities and lack of support from sexual partners as important influences (122). Additionally, defining individuals who are at risk is not straightforward as risk is something that change with time. The concept does not necessarily resonate with those who could benefit from PrEP and has been linked to stigma potentially hampering use (122). Understanding what the underlying contextual reasons for low engagement might be in a particular setting, is a priority.

A review on barriers and facilitators of PrEP for female sex workers, which included 11 quantitative studies, pointed to possible side-effects, stigma connected to PrEP use, fear of being seen as HIV positive, client/partner disapproval and difficulties with tablet intake/inconvenience, alcohol, education and economic burden as possible barriers (123). The Benin study referred to earlier, indicated mobility as the main reason for lack of retention (118).

To further understand some of the reasons for low engagement with different aspects of the cascade among female sex workers, it is useful to review some of the qualitative evidence from low-and middle-income countries. Potential impediments presented in studies is being labelled as "high risk" and a potential carrier of HIV (124), being mistakenly identified as HIV positive due to the inability to differentiate between ART and PrEP and further leading to stigmatization (124-126), disbelief that a pill can prevent HIV and conflicts with partner or other sex workers and exposing sex work to others (124). Side-effects and pill size (125, 126), daily pill taking and forgetting (126) and alcohol's possible interaction with PrEP (127) have also been voiced as concerns by participants.

Despite the variable adherence and continuation rates, many sex workers have expressed that they find PrEP useful. Qualitative research has given unique inside access to a range of motivational factors for PrEP among female sex workers: the desire to stay HIV negative and protect oneself from HIV as many live with fear due to occupational hazards, such as condom bursting, violence or being drunk (125, 126, 128, 129), the power to make their own decisions and taking care of oneself (125, 129, 130), having the option of condomless sex to meet financial needs (128, 130) responding to positive encouragement from friends and family (128), and aspirations tied to motherhood (128, 129) . PrEP has also been reported to increase sexual pleasure and or intimacy among female sex workers and other HIV negative women (130, 131).

When assessing women's particular needs for HIV prevention, discrete choice experiments have found that women prefer low-burden prevention tools that fit with their lives and can instill a peace of mind (132). A study investigating preferences for long-acting and oral PrEP among female sex workers in Tanzania and the Dominican Republic found that long-acting PrEP was mostly preferred due to expectations of less side-effects and stigma compared to oral formulations, and concerns about daily intake with the oral pills (133). Additionally, overnight stays with clients, fear of violence from clients and alcohol use was pointed to as challenges for daily intake (133)

2.2.2 PrEP services – with a particular focus on female sex workers' needs

PrEP should be offered as part of a combination prevention approach, as outlined earlier, which in addition to the biomedical tools such as PrEP include behavioural and structural components (66). A review on PrEP use among sex workers points to educational efforts to decrease stigma, education on how PrEP works, lifestyle modification (including addressing alcohol abuse), research into new PrEP products and integration of PrEP into health services that already exist as possible remedies to the barriers they can face (123). There is increasing acknowledgement that implementation of PrEP is dependent on structural factors such as poverty, violence and health system factors (134), and female sex workers face particular challenges in this regard, such as stigmatizing health services, fear of authorities and unplanned travel, that also needs to be addressed to make services work for them (61, 135). UNAIDS have stressed that programs and policies that "put people first, confront inequalities, uphold human rights and forge trust between public authorities and affected communities" (1 p. 13) have been some of the most successful HIV responses, which is indeed relevant for female sex workers friendly PrEP services. Community-led approaches where sex workers can exert leadership are essential (1, 66, 67, 136). Other important lessons learned from ART programs in Sub Saharan Africa is to streamline laboratory testing, expand the possibility to prescribe the medication, and ensure differentiated service-delivery (137). In the updated WHO implementation guidance for PrEP, making PrEP delivery simplified (for instance reducing the demands for some laboratory testing), and ensuring differentiated service-delivery making PrEP easier accessible are the focus areas (43).

As UNAIDS have highlighted, HIV programming needs to be mindful of women's specific needs, and ensure enabling environments (1). Long standing gender inequities are in many context hindering access to services, and facilitate HIV transmission (1). Gender-based violence is identified as a major obstacle to women's health and risk of HIV (1). There is also evidence to suggest that GBV hinders uptake of HIV services (105) and might have impact on PrEP as well, though evidence is still limited (138).

Despite the findings on PrEP use among female sex workers outlined in the previous sections, the body of evidence is still limited (107), and there has been a call for more studies examining different aspects of the PrEP use among this group of women, especially in more real-life settings (123). Additionally, it is important to acknowledge the complexity and diversity of

female sex workers' lives when proposing and suggesting interventions to improve the health (and wellbeing) of this group. As we will see, the social ecological model and other critical public health theories can aid to shed light on these complexities, and guide studies, so that we refrain from making simplistic assumptions and recommendations, typically focused on individual behaviour change alone.

2.3 Tanzania

The United Republic of Tanzania still have a considerable challenge with HIV/AIDS despite having seen remarkable progress since the beginning of the epidemic. In this chapter I will start by presenting a short overview of the country and its people, with a particular emphasis on health and the health system. I will then move to an account of key populations groups in Tanzania, focused on research and knowledge about sex workers. The last two sections will give an overview of the HIV epidemic and the country response, and finally an account of Pre-exposure prophylaxis implementation.

2.3.1 Country profile

The United republic of Tanzania (referred to as Tanzania in this work), comprises of mainland Tanzania and the Zanzibar Islands, in East-Africa. It borders the Pacific Ocean to the East, Kenya to the northeast, Zambia to the south-west, Rwanda Burundi and the Democratic Republic of Congo to the west, and finally Malawi to the South (139), and is divided into 31 administrative regions (139). The capital is Dodoma, while Dar es Salaam its economic hub with most inhabitants (139, 140). The overall population has increased markedly the last decade and by 2022 counted almost 62 million people with average age of 18 years (139). Almost half live under the poverty line at 2.5 USD a day, though the economy has steadily been increasing and the country from 2020 belongs to the "lower middle-income country" World Bank category (141). Most Tanzanians live in rural areas, but several city areas are experiencing increasing urbanization, including the city of Dar es Salaam (142). Tanzania continues to be one of the highest aid recipients, but also implementation of macroeconomic policies, increase in foreign direct investments and a stable political environment have by experts been deemed important (143).

Tanzanians make up a varied population, with a plurality in regard to "ethnic" groups, thus there are many different tribal languages spoken in the country, but Kiswahili is the national language and have been seen as a uniting force. With regards to religious affiliation, official

figures are unavailable, but it is estimated that about half of the population are Christian and the other half are Muslims (144). Compared to neighbouring countries, there has been less politicized ethnic tension in Tanzania.

2.3.2 Health indicators

Tanzania has overall made large improvements in relation to the health status of its population (141). Life expectancy has increased from 51 years in 2002 (141) to 66 in 2021 (145). Substantial improvements have been seen in for childhood nutrition and communicable diseases such as malaria, tuberculosis and HIV. Under-five childhood mortality has declined from 147 per 1000 live births in 1999 to 43 per live births in 2022 (146). These improvements has been attributed largely to increased access to health services including primary care facilities (141). For instance has the number of health facilities increased from about 5250 in 2007 to almost 8500 in 2019. The Health Sector Strategic Plan 2021-2026 also acknowledges that social determinants are important, and that improvement of health needs to be driven through inter-sectorial collaborations (141). This is particularly important when addressing some of the major challenges the country still face in relation to health: such as stark inequities in health burden and inequities in access (141, 147), which is particularly relevant for the country's HIV epidemic as we shall see. Additionally, the burden of non-communicable diseases has grown, and despite the abovementioned improvements, the county is not on track achieve the SDG targets for neonatal and child mortality, while maternal mortality has not declined sufficiently (141). There are also increased challenges in urban areas, such as in Dar es Salaam, with high levels of unemployment, densely populated zones, and stark inequalities, where also HIV prevalence is high (141).

The aim of the sectorial framework towards 2030 is to move towards universal health coverage and highlights people-centred service delivery, better coordination, improved governance and accountability, and increased focus on primary and community health (141).

2.3.3 The HIV epidemic and response in Tanzania

The first cases of HIV was reported in Tanzania in 1983 (148), and in the following decades the epidemic has had a profound effect on all sectors of the country (149). The primary transmission route until today has been heterosexual sex, and is estimated to currently account for 80% of new infections (149, 150). The country epidemic has been stated to be driven by a complex mesh of socio-economic disparities, gender inequities, cultural practices like

polygamy, multiple sexual partnerships, substance abuse and other behavioural factors (149). Another reason for HIV's widespread extension in Africa, including Tanzania, compared to other regions was the high proportion of young people making up the population. For instance, in the mid-1990, one third of Tanzania's inhabitants were youth between 10 and 24 years (151). At the epidemic peak in 1993, the incidence rate was 7.7 cases per 1000 people. The incidence and prevalence have steadily decreased and the prevalence is currently estimated to be 4.4%, with a total annual incidence of 0.17 in the latest impact survey from 2022-2023 (7). Compared to the estimates in 2017 this is a drop from a prevalence estimate of 4.9%, and an incidence 0.25% (152). It has been argued that the decline in the of new incident infections have remained slow (150). Prevalence varies substantially by region with Iringa (11.1%), Mbeya (9.6%) and Njombe (12.7%) having the highest estimates, while Kigoma for instance in the north-west has a prevalence of 1.7% (7). In Zanzibar, which is a partly self-governing region the prevalence is as low as 0.4% (7).

Although Tanzania's AIDS response has been impressive in many respects, gender inequities persist (7). The HIV prevalence among women (5.6%) is almost twice that of men (3%) (7). The annual incidence is also higher among women than among men, 0.11 and 0.24, respectively (7). The difference is especially striking for young women and adolescent girls (15-24 years) compared to young men, with the former having an incidence of 0.33 compared to an estimated 0.00 among men/boys (7). The gender inequities have been attributed to differential distribution of HIV risk factors, including social determinants such as education and financial status, indicating that altering these inequitable structures would have substantial effect (153).

From the national level the HIV response has been led by the Ministry of Health (MoH), The Tanzanian Commission for AIDS (TACAIDS) which is a department under the Prime Minister's office, the Zanzibar AIDS Commission (ZAC). The National AIDS Control Programme (NACP) has been a central part in this work. Efforts to mitigate the epidemic has been supported by external partners such as the Global Fund, PEPFAR, the World Bank and other partners and bilateral donors, and spending has been substantial. For instance, in 2018 the annual budget for HIV/AIDS programs in Tanzania amounted to 212 billion Tanzanian shillings (USD). The PEPFAR program contributed almost three quarters of the budget (154). Investments has been put into both treatment and prevent programs to increase coverage of these services, through community based and health facility based interventions (155).

Community level efforts in the epidemic has also been important in Tanzania. Many non-governmental organizations have engaged in activities to address different aspects of HIV. Already in 1988 did the "Women and Aids in Africa" (SWAA) develop, which had branches in many different countries, including Tanzania (156). Here women took an active role and highlighted that improvement of women's status in society was essential. WATAMA was another early organization made up by people living with AIDS founded in 1989, first focusing on high income population, but with a gradually more focus on the poor (156). Community organizations among key populations and peer educators have also been important, for instance is the use of sex worker peer educators described in literature during the early days of the epidemic where they promoted condoms and health seeking for STIs (157, 158) . For men who have sex with men community organizing was for the first time referred to in the literature in 2003 as described by Moen et.al in their review on same-sex practicing men in Tanzania (159).

The country has issued several frameworks and guidelines relating to HIV care and prevention underlining the priority this condition has received (150, 160, 161). Some of the most central documents guiding the national response is the National Guidelines for the Management of HIV and Aids (8), the National HIV and AIDS Multisectoral Strategic Framework (161) and the Health Sector HIV and AIDS Strategic Plan (9). They focus on what is termed innovate approaches: "Treat all" approach, condom promotion, voluntary medical male circumcision (VMMC), but also the importance of community approaches (9). The importance of decentralized services and integrated HIV treatment, care and support (CTC) has also been stressed (9).

In 2023, Tanzania was one of the few countries reported having achieved or to be on track for achieving the 95-95-95 goals (1), with estimates currently being 82.7% knowing their status, 97.9% on ART, and 94.3% suppressed viral load (150). It has been clear however, that the national epidemic has affected some groups harder than others. In 2014 (and updated in 2017), the country issued its first national guideline for key populations (160, 162), effectively acknowledging that heightened measures needed to be taken to reduce the incidence among these groups (160).

2.3.4 Female sex workers – a key population in Tanzania

Research about sex work in Tanzania varies greatly with regards to field and disciplinary traditions. This section will draw on different literature to give insight into some of the complexity of the trade and the women involved, including health status and life circumstances,

but with a dominance being on public health literature that relates to the HIV epidemic among this group of women.

Female sex workers have been a central population within the HIV epidemic from the early years of the epidemic. A study conducted in 5 regions of the country has estimated that 5.6% of the female population 15-49 years is a female sex worker (163), while the integrated bio-behavioural survey (IBBS) (6) estimated the number in Dar Es Salaam to be only 9500, underscoring the uncertainty in these estimates. As early as in 1986 as many as 29% of bar maids in Dar es Salaam (known to commonly sell sex or have many sexual partners) were estimated to be HIV positive (148). HIV prevalence was in the more recent IBBS survey estimated HIV prevalence at 26.6%, with Dar es Salaam being one of the regions with the highest prevalence at 32% (6). Consistent condom use was reported by about a third of those participants. In 2017 the survey was repeated in Dar es Salaam, and it found decreasing prevalence rates, estimated at 15.3% (6). Higher education was one of the factors associated with HIV seronegativity (6), underlying the importance of social determinants. Health seeking behaviour was reported to be high (95%) with over three quarter having had an HIV test within the last year. Another study conducted in two other geographical locations (Njombe and Mbeya) as part of a community-based intervention trial for ART treatment for female sex workers found that less than one third were aware that they were HIV positive (164). A more recent study from Dar es Salaam has found that 85.4% of a female sex worker sample had ever had an HIV test, with 65.3% tested for HIV the last year (165). Never feeling stigmatized as a sex worker (PR=1.18; 95% CI 1.04-1.33) was one of the factors independently associated with HIV testing, also attesting to the importance of social drivers in HIV related behaviour (6).

Literature on sex work in Tanzania, or what was then referred to as prostitution, has been described long before the HIV epidemic (166). For instance in an article published in 1951, were the practice characterized as “a feature of sophistication in big towns” (166 p. 54), and where these women’s move to larger towns was seen as a way to break free from husbands who controlled them within rural communities (6). There have been more recent attempts to categorize the different “typologies” of female sex workers (167, 168) and research has commonly been justified with the role that sex workers play in transmission dynamics (6, 163). But these studies also give insight into the diversity of female sex workers and point to them not being a homogenous group (167). They are young females selling sex on the street, women soliciting clients in bars, women working from home, students or workers for instance in construction or agricultural business, or women addicted to drug-or alcohol who sell sex to

finance substance drug use (167, 168). Some women tend to more upmarket clients, others would be considered very poor, earn little and live in precarious circumstances (168, 169). Some are mothers, some are single, married or widowed (6, 169). Many of the commercial sex workers solicit clients in bars (170), and often barmaids have been studied as an indirect way of accessing women selling sex (171, 172). Typically sex work in this context is independent with no managers or "pimps", but the deal is made between the sex workers and the client (170).

It has also been argued that some of the practices commonly referred to as sex work might not be sex work or "prostitution", but instead that some of the intimate constellations and relationships between sexual partners in fact is another form of *"wifestyles"* (173). Adding to this complexity a note on transactional sex vs. sex work is also important. Studies have suggested that transactional sex which is a practice embedded in many relationships in Sub-Saharan Africa, including in Tanzania, increase the risk for HIV (174, 175). Transactional sex should be seen as something distinct from commercial sex work, although there might be overlaps and transitions (someone having transactional sex might later be involved in commercial sex). There has been attempts to define transactional sex (175, 176), and the practice has been suggested to be characterized by the implicit assumption of exchange, it being non-commercial and non-marital. In sex work, sexual encounters are commonly negotiated before the sex act takes place (176). In this study we are concerned with female sex workers, and not the practice of transactional sex.

Motivation for sex work has been found to vary, and has been attributed to basic survival, debt alleviation, drug use, coercion or desire for wealth or nice things (169). Women selling sex in different studies also express that providing for family and children is one important motivation (170). Beckham et al. (170) found in their qualitative study among female sex workers that participants idealized motherhood and hid their work which they deemed stigmatizing, by emphasizing their role in the community as mothers, where they typically dressed respectfully and had another position (170).

It is not clear to what extent the different surveys and trials conducted among this group in Tanzania have been able to capture the diversity of female sex workers, particularly due to the criminalized nature of sex work in the country, and the lack of a sampling frame to draw from. Therefore, some caution should be warranted when interpreting epidemiological estimates such as HIV prevalence or the occurrence of different risk-factors.

Socio-structural vulnerabilities are important drivers of the HIV epidemic and HIV related behaviour, as seen earlier, and evidence from studies in Tanzania have found several of such factors these to be a problem (147). Selling sex is illegal (177), and due to fear of legal action and stigma many opt to conceal their work (6). The IBBS from 2017 found a high proportion of women reporting being arrested (41.9%), assaulted physically (49.4%), and assaulted sexually (30.8%) in the last 12 months. There has also been crack-down of female sex workers and their clients, as in 2016 where 800 people in total were held by authorities suspected of engaging in prostitution (178). A recent study using program data and consultations with stakeholders, including representatives from the groups themselves, have investigated factors that negatively affect engagement with health services among key populations (147). They have found that stigmatization, lack of legal literacy, disruption of family ties, peer pressure or norms, little engagement from community and religious leaders and other stakeholders, lack of trained key population friendly service providers, and harassment and punitive laws and policies among others, were important (147). Other factors intimately tied to vulnerability are for instance alcohol use and drug use (54). Different studies in the Tanzanian context have reported high alcohol consumption among female sex workers (6, 63, 164), which has been found to be associated with inconsistent condom use and gender-based violence stressing the interconnectedness of social risks and circumstances (63).

Although socio-structural constraints are indeed present, female sex workers in Tanzania also exert agency, the ability to act and effect the circumstances they are part of (179). This can happen in different situations trough both individual and collective means (179-181). For instance did Van Bavel (179) illustrate that young females who sold sex in Zanzibar made use of an organization that worked to improve their situation. They talked about their rights and could refer to themselves in positive terms, and recognized the responsibility the health sector and the community had in relation to their health, thus not blaming themselves (179). Cooper et al. (181) who interviewed 20 female sex workers involved in a conditional cash transfer intervention, also found that despite constraining social circumstances, participants had significant possibility to decide on when and how to work, for instance by limiting partners or selecting the partners. The possibility to decide on condom use and other aspects of the sex work transaction was more variable (181).

Efforts to reduce the infection rates among female sex workers has been focuses on combination prevention and treatment strategies, such as behavioural interventions, i.e. increasing condom use and ensuring treatment (162). The need to offer other services, such as

those for substance use disorders, has also been highlighted in the key population guideline (160, 162). The work focused on key populations have often relied on engagement from several partners, including development partners (UNAIDS, PEPFAR etc.) and national non-governmental organizations or community-based organizations (160). There is also a recognition, at least through the national documents, that more individualized approached needs to be integrated with social and structural interventions. One example of such an intervention is the community empowerment approach such as shown in the "Shikamana"-study (65) which aimed to enhance social cohesion and mobilization to address socio-structural factors: stigma, violence, discrimination and financial insecurity, have found effect on both HIV prevalence, consistent condom use and gender based violence (65). There are also indications that community savings group, focused on economic empowerment of women, can have a positive effect on condom use (182). Another project, the SOAR project (183) has evaluated a community-based intervention to deliver ART among female sex workers. In both intervention and control group, the package consisted of other interventions as well as screening for sexually transmitted infections, escorted referrals to treatment facilities, condom promotion and provision, reproductive health services, substance use and TB screening and referrals in cases of GBV. In the intervention arm however, ART provision was offered through mobile clinics and home-based platforms. The study found that participants in the community-based arm were more likely to initiate ART and be retained in the program, with participants also being more satisfied with the program (183).

2.3.5 PrEP in Tanzania

In May 2021, the "Implementation Framework for Pre-exposure prophylaxis of HIV in Tanzania Mainland" (150) was finalized, and pre-exposure prophylaxis recommended as an additional prevention choice for female sex workers as part of the country's strategy to combat HIV/AIDS (150). The document highlighted that due to the disproportionate burden of HIV among key and vulnerable populations, a focus on these groups is much needed, while also underlining that in achieving the goal of "elimination of need HIV infections" and "ending AIDS", there is a need to target what has often been referred to as concentrated epidemics among key populations (150). It is also stated that since there are networks overlapping between key populations and rest of the population, the national responses can be jeopardized, if not addressed properly (150), and can be read as one of the arguments for the implementation framework. The framework was developed by the National AIDS Control Program (NACP),

with the support of the Ministry of Health (150). Foreign stakeholders (including PEPFAR) and implementing local partners have been central stakeholders (150).

The first PrEP demonstration project was conducted in 2017 under the leadership of NACP. It introduced PrEP in a stepwise approach to female sex workers, men who have sex with men, people who inject drugs and adolescent girls and young women, and HIV negative partners in sero-discordant couples, in 9 regions of the country, including in Dar es Salaam (150). The project enabled the development of monitoring and evaluation tools, training of providers and peers used peers to link clients to services (150). It also identified several challenges, including compliance with clinical guidelines/procedures, laboratory testing, supply of medication and monitoring, reporting and engagement with care (150). In total 7816 individuals were offered PrEP, 3,473 initiated it and less than half of those returned to the first follow-up visit (184).

After the demonstration study there were continued small scale roll-outs in collaboration with PEPFAR implementing partners, and at the same time the second draft of the implementation framework was developed while reviewing the lessons from the demonstration study and harnessing feedback from stakeholders (150). Some of the concerns listed were misconception of what PrEP was (thought to be a HIV vaccine), eligibility criteria for young and adolescent girls, insufficient condom programming being integrated, and there were also voices concerned about PrEP "degrading society morals" (150 p. 6).

A few surveys have reported on female sex workers and the topic of PrEP. These have mainly been concerned with the *potential* use, and has not studied actual use (6, 109, 171). In 2017 only 31.2% of the sample in the bio-behavioral study of female sex works had ever heard of PrEP, however over 90% said they would be willing to take it if available (6). The participants of the community-based "Shikamana" study in Iringa (109) was also surveyed about PrEP before its roll out (in 2015-2016), and 92% were unaware, but almost 60% would be interested in taking it, and found that social cohesion was associated with acceptability (109). Several potential challenges were expected with daily pill taking such as alcohol use, overnight stays with clients and fear of violence. Preference for long-acting modalities were expressed (109, 133). A study among bar workers, also found high willingness to use PrEP (171). Three identified studies have reported on *actual* use (185-187). One of these used data from a vaccine cohort of HIV negative female se workers between 2018 and 2020 and found that only 8% had ever used PrEP (the study itself was not supplying it), illustrating that PrEP at this time was not readily available (185, 187). Being married/cohabiting or separated/widowed/divorced and

having sex with a HIV infected partners were factors associated with ever using PrEP (185). It did not measure engagement/discontinuation with services. Another study among female sex workers in Tanga found that 55% of the surveyed women had ever used PrEP (187). Analyses of data from The Jhpiego-supported program between 2017-2019, has found that among the 6059 clients that started PrEP (in which 92.8% were female sex workers), 61.8% did not return for any follow-up, and only 17.5% attended follow-up on time (within 14 days of scheduled visit for refill) (186).

Summing up, although giving some insights into the current situation, the research on PrEP use in Tanzania is still in an early phase.

3.0 Study aims

This doctoral thesis aims to contribute to the continued progress for better HIV prevention in Tanzania, including improved programming and informing the scale-up of PrEP for female sex workers, through examining PrEP as an HIV prevention in this population, including factors that might interact with PrEP usage and disengagement with services.

Main Objective:

To investigate usage of PrEP and early disengagement from PrEP services among female sex workers in Dar es Salaam, using a socio-ecological approach

Specific objectives

1. To estimate the extent of early disengagement (at month 1) from PrEP services among female sex workers in Dar es Salaam
2. To estimate factors associated with early disengagement (at month 1) from PrEP services among female sex workers in Dar es Salaam
3. To explore PrEP usage including perceptions of and subjective experiences with PrEP among female sex workers in Dar es Salaam

4.0 Theoretical framework and analytical inspiration

4.1 The socioecological model

We have used the socioecological model as a conceptual framework when designing and executing the study. The socioecological model is inspired by Bronfenbrenner's ecological model to understand human development (188). It has been used in relation to different situations and problems, and is currently often used within the field of public health to highlight and account for the complexities of factors influencing risk of disease and prevention behaviour, and can thus be used as a framework for prevention (189, 190). It is relevant for understanding HIV risk and HIV related behaviour or what might influence behaviour change (190). Practically it distinguishes itself from more individually focused behaviour change models which has a long tradition among health behaviour researchers, where factors explaining behaviour typically are seen situated on the individual level (191-193). Such individualistic models have been criticized for their focus on individual risk and the assumption that users are rational decision makers, i.e., that they will act in a certain way if some psychological factors (for instance self-efficacy or behavioural intention) and particular knowledge is present, while not acknowledging HIV prevention as practices are shaped in social spaces with others (22). Socio-ecological models (or multi-level models as it sometimes is also referred to (190)) also encompass structural influences, thus highlighting that there are policies, structures, norms and systems restrict (or expand) people's choices.

The socio-ecological model posits that disease risk or behaviour is influenced by a range of factors situated at different "levels", from the micro/individual to the macro/structural (190). In-between you find the interpersonal/network, community, and institutional/health system (190). Some use ecological models with four layers instead of five (189), however the importance is the recognition of the complex interplay of factors that influence disease risk, behaviours, and or/behaviour change. Some factors can also be seen as operating on more than one level (for instance internalized stigma and societal stigma (147)). The model has also been used to understand factors influencing access to health services for sex workers (194). In this study, the socio-ecological model has been used to identify aspects that might affect PrEP use and engagement/disengagement with services (see figure 1) as the study was developed. The figure is inspired by Kaufmann et al' paper on health behaviour change models for HIV prevention and AIDS care (190), and developed based on literature on PrEP and assumptions

on factors that could be important for different aspects of PrEP use (such as uptake, adherence, continued use or disengagement from programs). One of the factors that were hypothesized to potentially affect PrEP use among sex workers was alcohol use, as some studies have indicated this to be the case (131, 195), while others have not found a link (110, 196). With the extent of consumption of alcohol estimated in different studies conducted among female sex workers in Tanzania (6, 63, 164), it was deemed a relevant factor to study specifically. In relevance to this, socio-ecological models or frameworks have also been used to study substance use and addiction (197, 198). The structural factors investigated in this thesis, have also been inspired by the HIV structural determinants framework for female sex workers, developed by Shannon et al. (4) that for instance highlights the effects of criminalization or short-term mobility to sex work hotspots on HIV risk (4).

Although the data collection in this study was conducted on an individual level (through interviews with participants), we sought to capture aspects of the socio-structural sphere through questions and conversations relating to for instance stigma, social support, arrests/incarceration, violence, mobility for sex-work, and previous and current healthcare experiences.

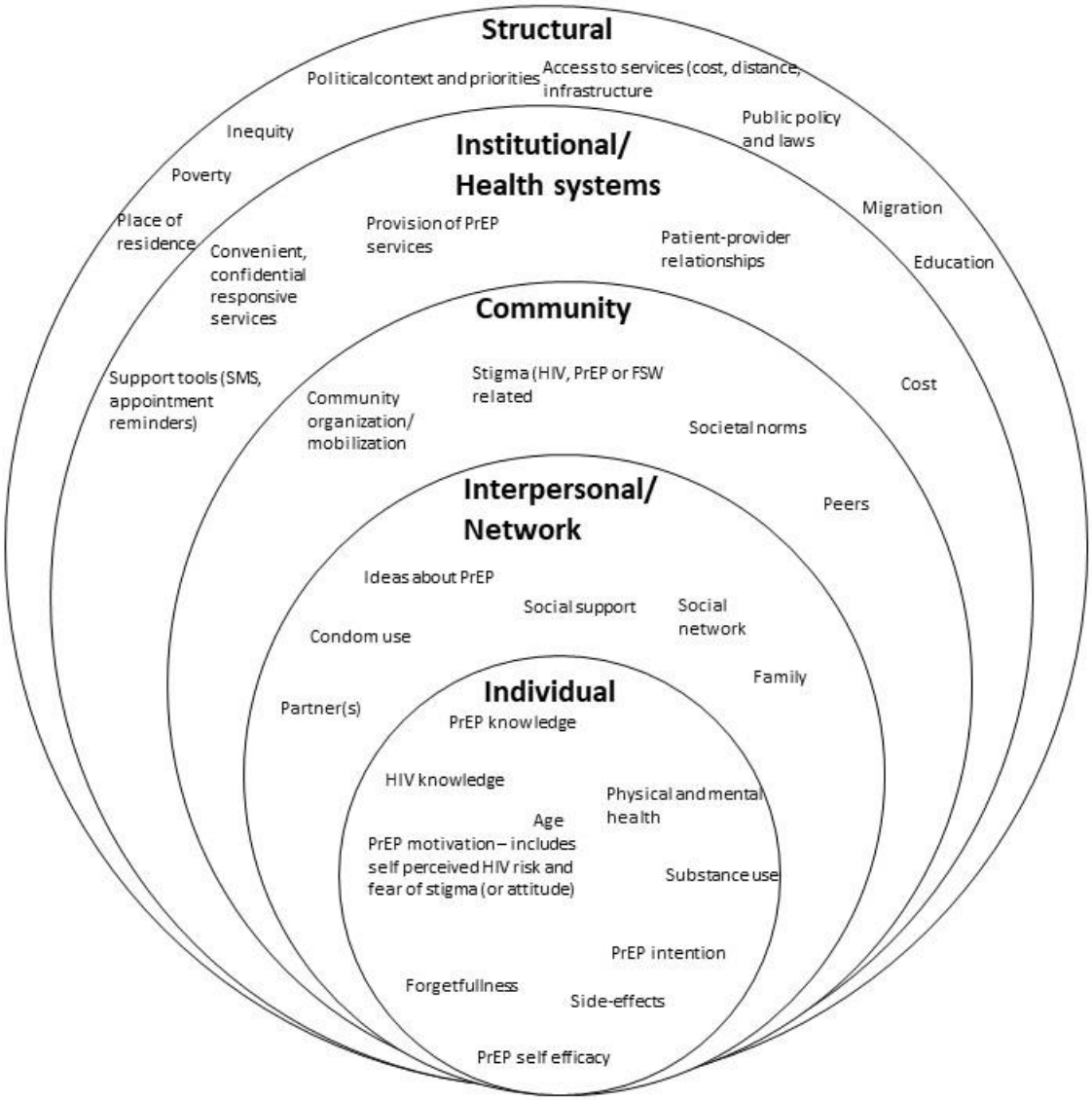

Figure 1: Socio-ecological model of factors influencing PrEP use, including disengagement with services

4.2 Analytic inspiration: Critical public health

In addition to the overarching socioecological model, critical public health (199) have also inspired this thesis. The theories, perspectives, frameworks or concepts which constitute critical public health have in common that they are *critical*, in the sense that they question different aspects of biomedicine and public health, and their solutions, while offering ways to understand complex health problems (199). Critical public health has its foundation in social science but is indeed an interdisciplinary field. The theories and concepts are highly relevant for the field of global health as they are concerned with health equity, are culturally sensitive and mindful of the dangers of public health acting in imperialistic manner (199). Several

theories and concepts have been useful during the study, from the planning stage to execution, and especially as an integral part of analysis and discussion. They have formed part of this thesis's *analytic inspiration* (200), something that has aided the researcher in "seeing" and understanding the field in new ways (200). In the following I will briefly present those who have been most central to the inquiry, and I will revisit them in the discussion in relation to the findings of the study.

4.2.1 Empowerment

Rappaport (201) refers to empowerment as "a process, a mechanism by which people, organizations and communities gain mastery of their own affairs (201 p. 122). Empowerment can be seen as both a "value orientation" and a "theoretical model" (202), and is concerned about people being able to take control over their lives, reach their goals and have the power to do so (203). Its origin comes from social studies and has gotten a broader reach within the health sciences, with a focus on underserved communities, such as female sex workers, becoming more empowered (51, 67). It posits that individuals and communities themselves have vital insights about their own situation, and therefore can address these aspects through empowering means as opposed to be dependent on so-called "experts" (202). Instead professionals becomes "collaborators" (202). Some of the critique against empowerment theory is that it can be used to hold individuals and communities responsible for their own wellbeing, while relieving institutions of these responsibilities, thus not attaining to socio-political structures (202).

4.2.2 Human flourishing

In line with WHO's definition of health as more than absence of disease, human flourishing is a concept that is concerned with the broad range of people's wellbeing, or "flourishing". There are several definitions and writings on human flourishing within a range of disciplines (204), but my work has been inspired by VanderWeele (205) who challenges much of public health's and other disciplines' focus on "a single disease" and narrow outcomes if the ultimate goal is "contributing to some a broader notion of human well-being" (205 p. 8149). It is suggest that human flourishing should encompass aspects of happiness and life satisfaction, physical and mental health, meaning and purpose, character and virtue and close social relationships (205).

4.2.3 Structural violence

Coined by Galtung (206), structural violence is a concept that conveys the idea that social structures, policies and institutions put people in harm's way, and by that exert a form of violence (206). The concept has been used within critical public health scholarship, maybe most famously by Paul Farmer (207) to describe how detrimental social structures, such as poverty, ethnic disparities, racism, and unequal access to resources, have shaped HIV epidemics (and other ills) in different contexts. He called for more structural interventions to meet these violent conditions, while also acknowledging the importance of more proximal interventions, closer to the individual, such as access to medicines (207).

4.2.4 Medicalization and the biomedical turn of HIV prevention

Medicalization means "to make medical" (208 p. 105), and refers to the process in which more and more of everyday life becomes understood and sought solved by "medicine", famously referred to and critiqued by Ivan Illich in "Medical Nemesis" (209). Medicalization can have both beneficial and problematic consequences, depending on history and context, and which perspective one is arguing from (210). Medicalization can give people explanations for problems and remove individual responsibility, but by understanding problems it in a classic (bio)medical way, it can also obscure the socio-structural influences of health, disease, and prevention (208), and in so doing making social problems, medical. It might also make people dependent on biomedical solutions and create more people who are "pre-sick" (or "at-risk"), and by this medicalize prevention (33). Medicalization is not only driven by the "medical community", but also by other societal forces such as companies and business (for instance the pharmaceutical industry), the media and clients (210).

Medicalization is thus closely linked the critical writings of what has been referred to as the turn to the era of biomedical prevention by Kippax and others (69, 70, 211). While acknowledging the promise that biomedical solutions such as PrEP can have in the HIV epidemic, these writings posits that social science perspectives should be more integrated in prevention efforts, and that dependency and investments mainly in biomedical interventions, threatens to obscure the efforts that community themselves have done to respond to the HIV epidemic in various ways (69). Examples are many such as serosorting (22), sex workers collectives increasing condom use through social cohesion and community mobilization (24) and social movements to engage with prevention (22, 36). It can also, in a reductionist way,

create a false separation between biomedical, behavioural, and structural interventions, when in fact many of these are often a mix (69). Even efficacious biomedical "solutions", like pills, need people to engage with the prevention if it is going to work, or be *effective*, in a given context (36, 69). Syvertsen et al. have particularly pointed to the importance of interdisciplinary approaches for HIV prevention among female sex workers (212).

4.2.5 Medical mistrust

Medical mistrust is a term that has often been used to refer to the idea that individuals and communities are sceptical to biomedical advances and public health recommendations (127). The HIV epidemic in particular has been surrounded by "conspiracy beliefs", i.e. the beliefs that people in power are acting together to achieve some evil goal (127). These have included ideas about ARTs being used to kill people, or that HIV is man-made to eradicate certain groups of people (127). Medical mistrust has been found to impact uptake and utilization of services and poorer management of a range of medical conditions (127). However, often framed as problem situated within the individuals and communities that express this mistrust, thus implying that it is mainly due to "cultural barriers" (127). This disregards the historical and contemporary injustices that impact this phenomenon (127). There are for instance a myriad of examples of highly unethical experiments subjected to typically underdeserved communities and ethnic minorities, in the name of "medical advancement" (127). The most infamous medical "experiment" is perhaps the "Tuskagee trials" in which researchers studied the natural occurrence of the syphilis in African American men in the U.S, without offering them treatment when this became the standard treatment, resulting in many deaths (127). There are also several examples of colonial and postcolonial medical abuses, such as the forceful sterilization of Latin-American women (213) or even more recent forceful sterilization of Namibian HIV positive women (214). There are further examples of problematic biomedical studies within the HIV epidemic conducted on people in marginalized situations, such as the first PrEP trials among female sex workers in Cambodia and Cameroon which were shut down after received significant criticism regarding exploitation of participants (70). Finally, the common practice of "off-shore" trials in biomedicine (70), where trials conducted among groups that will not benefit from the drugs, has also fuelled scepticism among advocacy groups and former participants of trials (70).

5.0 Methodology

5.1 Mixed methods

This study used a mixed-methods design to explore different aspects of PrEP use. According to Creswell (215), mixed methods is a procedure where one in a single study collects, analyses and mixes both qualitative and quantitative data to be able to comprehend a research problem in a more complete way (215). It is a school of inquiry that is informed by common conceptual positions i.e. the rejection of the "either/or" choices and characterized by methodological eclecticism using the most appropriate techniques from both qualitative and quantitative methods to thoroughly investigate a phenomenon (216). It is also typical to integrate conceptual theoretical frameworks throughout the research process (217), as presented earlier, and which will be further elaborated on in the result section and in the discussion. In this study the quantitative and qualitative component ran parallel (figure 2), and informed each other, for instance, gaining a better understanding of participants' reasons for disengagement with PrEP services through the qualitative interviews, as the results of the quantitative data collection were beginning to emerge.

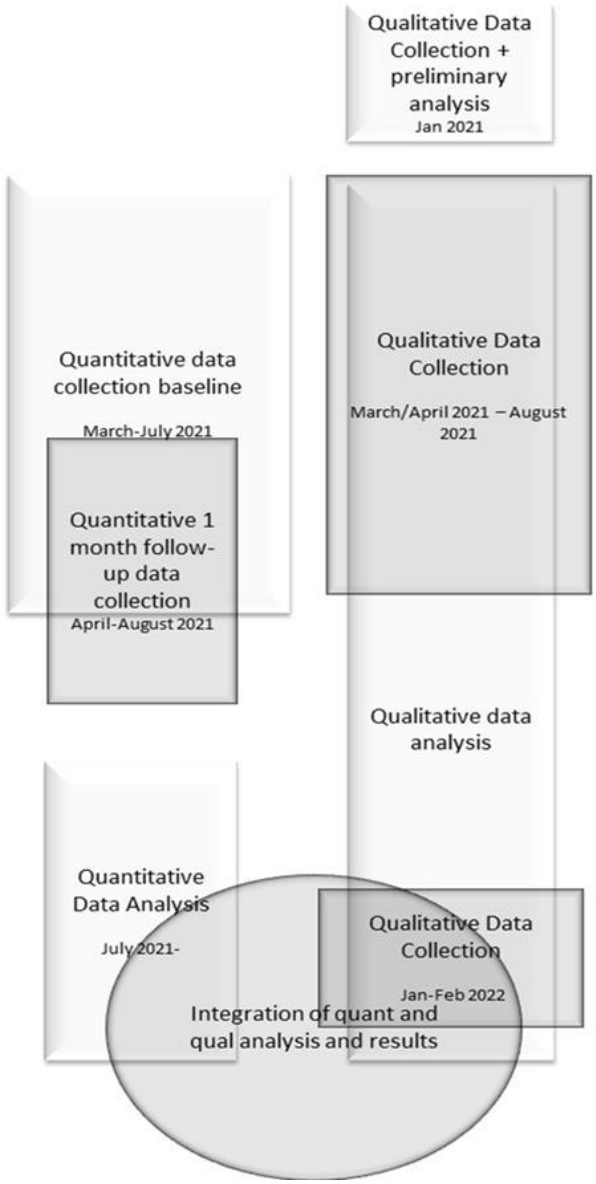

Figure 2: Mixed methods and study progression

This study, in line with mixed methods research, incorporated methods to both assess the *magnitude* and *frequency* of constructs (quantitative), such as the two outcomes: harmful alcohol use (a factor hypothesized to be associated with disengagement with PrEP services) and disengagement with PrEP, and *understanding* constructs (PrEP perceptions and experience) (qualitative).

The methods chosen were based on a *pragmatist* stance, i.e. that using the methods that had the best fit for the different research questions, but with *ontological pluralism* as the

philosophical foundation, which acknowledged the realities discussed in both qualitative and quantitative traditions (218). Using mixed-methods meant that we moved between research traditions acquiring knowledge through different "lenses" as well as being open to different ways of understanding knowledge production.

The quantitative component was grounded in neo-positivism; i.e. that knowledge comes from systematic observation and the method of hypothesis-testing (falsification) (219), however with the appreciation for the fact that many of the constructs used and measured in the study are informed by *subjectivities* (such as where do one set the cut off for disengagement with care, or what is in fact harmful alcohol use if not a cut off on a scale made by humans) and also an appreciation for the subjective experiences and efforts had led to the conceptualization of PREPTA and my own study (more on this in methodological considerations section). In the qualitative work I have been inspired by interpretative and social constructivist schools of thought that multiple "realities" exist and that "knowledge is created and shared subjectively" (220). Table 1 outlines the research paradigm and foundations of this work.

Table 1: Research paradigm and methodology (218-220)

Philosophical Foundation	Pragmatism and ontological pluralism		
Paper	**Paper 1**	**Paper II**	**Paper III**
Purpose	To measure the prevalence of harmful alcohol use and associated factors	To measure early disengagement with services and associated factors	To explore perceptions of and experiences with PrEP
Epistemology	Neo-positivism	Neo-positivism	Social Constructivism and Interpretative phenomenology
Researcher position	Outsider	Outsider	Insider/Outsider
Logic of inquiry	Deductive	Deductive	Inductive/Abductive
Research method	Quantitative survey	Quantitative survey	Qualitative interviews and observations
Analysis and discussion	Descriptive statistics and multivariable modelling	Descriptive statistics and multivariable modelling	Interpretative phenomenology and reflexive thematic analysis

5.1.1 A part of "PREPTA – Pragmatic Trial of Pre-exposure prophylaxis roll-out"

This PhD study formed part of a larger mixed-methods study: "Pragmatic trial of pre-exposure prophylaxis roll-out" (PREPTA) in Tanzania that received its funding in 2019. The aim of

PREPTA was to support the roll-out of PrEP through the exploration of different aspects of PrEP use, and PrEP implementation among two key populations: female sex workers and men who have sex with men, and create and test a mHealth app in collaboration with key populations. In the PREPTA study, Dar es Salaam served as the intervention site where participants had access to the mHealth app, and Tanga acted as the control site where participants did not have access to the app.

This multidisciplinary collaborative study was conceptualized and planned by researchers from the Institute of Health and Society, UiO and at MUHAS in Dar es Salaam, Tanzania. Its foundation is built on a long-standing collaboration, and draws on competencies from diverse fields such as epidemiology, statistics, medical anthropology, behavioural science and clinical medicine. The planning and execution of the project was conducted through collaborative efforts between senior researchers, doctoral candidates in PREPTA and field staff including peer educators. The following sections presented in the methodology will be related to the PhD project only.

5.1.2 Study setting

The study was conducted in Dar es Salaam, which makes up the commercial capital of the country (140), where the overall HIV prevalence is 4.2% (7). The city is situated by the Indian coast and is divided into five administrative districts: Kinondoni in the north, the centrally located Ilala, Temeke in the South and Ubungo in the south-west and Kigamboni in the east (139, 140). The city has grown drastically in the current years both in economic terms and in its population density and is estimated to become one of the mega-cities with more than 10 million inhabitants (141). In 2022 it was estimated that almost 5.4 million people were living in Dar es Salaam (139). The population growth stands at 7%, more than double of the rest of the country (141). The city comprises of many people migrating from other areas of the country for opportunities (141). There is an increasing acknowledgement that this growth also has come with a price (141). There are areas that are so densely populated that although they are not considered slums, they exhibit some of the characteristics associated with slum areas (141). Despite the presence of a relatively high number of health facilities, estimated at 572, compared to other regions of the country, the majority of these are private (≈ 80%), and has not translated into better health outcomes compared to rural areas, especially not for those economically less off (141). As an example, life expectancy is almost 20 years lower among urban poor than among the rural population in Tanzania (141).

The study itself took place within an educational facility in a central part of the city where the collaborating non-governmental organisation (NGO) set up its satellite clinic. Measures were taken with the aim of making it a friendly and accommodating place such as training of the field assistant team in conducting and interactions with the guard staff outside the compound. The clinic was responsible for the provision and follow-up of PrEP.

5.1.3 Study population

The study population comprised of female sex workers, defined as women selling sex in the last 3 months preceding study inclusion. Other eligibility criteria were being 18 years or older, living in Dar es Salaam for at least 6 months, owning a smartphone, and having the ability to give an informed consent, and being interested in and eligible for per national guideline (8) to start PrEP as part of the services offered from the collaborating clinic.

5.2 The quantitative component

5.2.1 Sample size estimation

The sample size estimation in the "mother study" was based on the primary outcome "adherence to PrEP", and the difference between the intervention (Dar es Salaam) and the control site (Tanga). This yielded a minimum sample size of 423, which with 80% power would estimate the differences in adherence of 15%, even with a potential 20% loss to follow-up, with an estimated adherence in the control group set to 50% (as this number was uncertain at start study).

While the sample was already predetermined by the primary outcome of the mother-study, we conducted sample size estimations in accordance of the specific objectives outlined in this thesis as one of the ways to ensure precision in the estimates. For paper I regarding harmful alcohol use, based on a single proportion sample size calculation using a 95% confidence level, a 5% margin of error and assuming an estimated level of harmful alcohol use at 50%, a sample size of 383 would be required (221). Using the same inputs including a 50% proportion of disengagement, using a slightly different calculation, yielded a sample of 385 (222). In both cases the sample size in the mother study was more than sufficient.

5.2.2 Participant recruitment

Participants were recruited through respondent driven sampling (RDS) (223, 224). This is a sampling strategy that is sometimes used when a sampling frame is not easily obtained, and in contexts where participant might be "hidden" or otherwise "hard-to reach" as if often stated about key population groups, although this view has been challenged (225). It is a form of peer recruitment, based on "snowball-sampling" commonly employed in social sciences, but modified to mitigate the biases associated with this method, by weighting the sample based on network size, with the assumption that those with larger networks recruit better than those with smaller networks as they know more people in the target population (223, 224). RDS also requires that individuals belonging to the group the study is aiming to recruit, are connected to each other through social bonds and that there is reciprocity between recruit and recruiter relationships, i.e. that it would be equally likely that the person being recruited instead could have done the recruitment (223).

The recruitment started with a few selected sex workers, referred to as "seeds", who were thought to have good networks and thus could facilitate easy recruitment. These initial participants represented a variety of characteristics as detailed in table 2. These were given three "coupons", or study invitations to recruit their peers. The recruited peers, in turn, received additional coupons to facilitate the recruitment of the subsequent wave of participants. Coupons contained just the necessary information about locations and opening hours, and timing until the coupon expired, but no information regarding study procedures, PrEP or sex work. This information was instead conveyed orally through the peers themselves. Recruitment continued in this fashion until we reached a slightly larger sample than required according to the sample size estimation. All participants received an incentive for being interviewed and one incentive for recruiting peers as procedure in RDS (224): 8000 Tanzanian shillings (TSh) (≈ 3.5 USD) and 4000 TSh (≈ 1.75 USD), respectively.

Table 2: Summary of characteristics of selected seeds

Age	**Education**	**Income (Tsh)**	**Children/living with them**	**Location**	**Solicit clients at:**
20	Some secondary	120, 000	No	Temeke	Bar/disco/pub
32	Completed secondary	200, 000	Yes	Kinondoni	Bar/disco/pub

28	Completed secondary	200, 000	Yes	Temeke	Bar/disco/pub
37	Completed primary	250,000	No	Ilala	Bar/disco/pub
28	Completed secondary	1,000,000	No	Ubungo	Internet
29	Some secondary	500 000	Yes	Kinondoni	Bar/disco/pub
28	Completed secondary	1 400 000	Yes	Kinondoni	By phone
28	Completed primary	300 000	Yes	Ilala	Bar/disco/pub
23	Above secondary/university/ college	80 000	No	Kinondoni	Bar/disco/pub

Respondent driven sampling (RDS) also requires the registration of key aspects about the participants in order to perform subsequent analyses of the collected RDS data. These aspects included personal network size, participants' coupon number, and the coupon number of the recruiter (223, 224). This is used in the analytic procedure to weight the sample as a way of enhancing representativeness.

Study staff members, including peer educators, assessed participants for eligibility in alignment with the study criteria. Simultaneously, the clinic evaluated their suitability for PrEP and initiated eligible participants on PrEP in accordance with the national criteria at that time (8), (table 3), with the exception of age, which was set at 18 at this specific location.

Table 3 : Eligibility criteria for PrEP initiation per national guideline (8)

Eligibility criteria:
Aged 15 years or older
HIV sero negative and no suspicion of acute HIV infection
At substantial risk of HIV infection
No suspicion of acute HIV infection
Creatinine clearance > 60 ml/min
Willingness to consent for and use PrEP as prescribed
No allergy or contraindications to any medication within the PrEP regime

5.2.3 Data collection

The baseline data collection started in March 2021. Trained research assistants interviewed participants face-to-face using a structured questionnaire which was accessed from tablets and where participants' responses were recorded. This questionnaire had been developed over several months through collaborative efforts by the study team. The final version was plotted into the University of Oslo's web-based questionnaire solution "Nettskjema" (226). The questionnaire covered a wide range of aspects relating to background, HIV prevention, PrEP and mobile health (table 4). For the complete baseline questionnaire (Swahili and English version) see the appendices. The questionnaire was pre-tested involving field assistants and peer educators, and amended and refined based on the feedback received, before the study commenced. The interview took about an hour and was conducted in Swahili. After the interview was finished, participants' responses were uploaded in encrypted form through "Nettskjema" to "Services for Sensitive Data" (TSD) (227) developed and operated by the University of Oslo. This is a secure storage platform that facilitates data collection and storage from anywhere in the world (227). The only follow-up data used in this study was the registration when participants attended their first follow-up visits. This was typically scheduled a month (28 days) after PrEP initiation/baseline.

Table 4: Outline of baseline PREPTA questionnaire sections, tools/scales, sources and number of questions

	Section	**Tool**	**# of questions**
	Network	Standard for RDS	7
	Sociodemographic characteristic Age, sex, level of education, residence, marital status, housing status,	Standard sociodemographic questions PREPTA developed questions	10
	Sex work	PREPTA developed questions Questions on mobility from "Shikamana" study (67)	9
	Sexual practices, clients and partners	PREPTA-developed questions	20
	FSW stigma, violence and incarceration (structural determinants)	Adapted questions from "Shikamana"-study (67) IBBS survey questions	21
	HIV knowledge, prevention and medications	IBBS survey questions (6) PREPTA developed	14

	PrEP Information motivation behaviour model + PREP anticipated stigma	IBM scale inspired by: scale for PWID (228) and MSM (229, 230) Stigma scale adapted from (231)	36
	Alcohol use	AUDIT (Alcohol Use Disorder Identification test (232)) 1 PREPTA developed question	11
	Drug use	Two item conjoint drug disorder screen (233) PREPTA developed IBBS survey questions (6)	9
	Social support	Duke FSSQ (234)	8
	Health, Access to services and previous experience with health care	PREPTA developed PHQ2 (235) GAD-2 (236) Overall health	9
	Perspectives, experiences and willingness to use mHealth	Based on different studies on mHealth	10
	App-related questions, expected benefits and barriers	Based on different studies on mHealth	31
	Total		195

5.2.4 Measures

The following section will present the measures used in this study. As the aim for the first two papers was both to measure the proportion of the outcome (its prevalence) and associations with socio-ecological factors, the outcomes, exposure variables, and the control variables will be presented in separate sub-sections.

Outcomes:

Harmful alcohol use (paper I) is considered a risk factor for HIV (62, 237) and have also been associated with adherence to PrEP among female sex workers (195). Although studies from Tanzania have shown that alcohol use is prevalent among female sex workers (6, 164), to date no study had assessed the prevalence of harmful alcohol use among the aforementioned population using the alcohol use disorder identification test (AUDIT) (232). This is a validated 10-item measure used in clinical and epidemiological settings worldwide and indicates who might benefit from reduction in alcohol intake by screening for hazardous and harmful alcohol use and dependency (232). We used a Swahili version validated among traumatic injury

patients in Tanzania with small alterations in some of the wording (238). Table 5 outlines the content of AUDIT.

Table 5: AUDIT and its different sections (232):

Screens for:	Meaning	AUDIT Questions	(Scoring) Answer options
Hazardous drinking traits	Drinking that might increase the risk of harmful consequences, despite sign of current disorder	1.How often do you have a drink containing alcohol?	(0) Never (1) Monthly or less (2) 2-4 times a month (3) 2-3 times a week (4) 4 or more times a week
		2.How many drinks containing alcohol do you have on a typical day?	(0) 1-2 (1) 3-4 (2) 5-6 (3) 7,8,9 (4) ≥ 10
		3.How often do you have more than six drinks on one occasion?	(0) Never (1) Less than monthly (2) Monthly (3) Weekly (4) Daily or almost daily
Harmful drinking traits	Consumption pattern with mental or physical health consequences	4.How often during the last year have you found that you were not able to stop drinking once you started?	(0) Never (1) Less than monthly (2) Monthly (3) Weekly (4) Daily or almost daily
		5.How often during the last year have you failed to do what was normally expected from you because of drinking?	(0) Never (1) Less than monthly (2) Monthly (3) Weekly (4) Daily or almost daily
		6.How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?	(0) Never (1) Less than monthly (2) Monthly (3) Weekly (4) Daily or almost daily
Dependency traits	A constellation of social, behavioural and physiological changes related to use of the alcohol	7.How often during the last year have you had a feeling of guilt or remorse after drinking?	(0) Never (1) Less than monthly (2) Monthly (3) Weekly (4) Daily or almost daily
		8.How often during the last year have you been unable to remember what happened the night before because you had been drinking?	(0) Never (1) Less than monthly (2) Monthly (3) Weekly (4) Daily or almost daily
		9.Have you or someone else been injured as a result of your drinking?	(0) No (2) Yes, but not in the last year (4) Yes, during the last year
		10.Has a relative or friend or a doctor or another health worker been concerned about your drinking or suggested that you cut down?	(0) No (2) Yes, but not in the last year (4) Yes, during the last year

To ensure that field staff and participants were informed about the content of a "standard drink", which is about 13 g of alcohol, we included a figure in the questionnaire that explained how much alcohol a standard drink contained (figure 3). As an example, a small beer (0.33 l and 4.5% alcohol) was considered one drink, while 0.5 l beer would be 1.5 to 2 "standard drinks" depending on alcohol content. The field assistants were also provided with a list of typical drinks in Tanzania, and what number of "drinks" they would amount to.

Figure 3: Illustration of standard drink (SE) provided to field assistants

The AUDIT has a score range from 0-40. The suggested cut off as recommended by WHO is a cut off score of 8-15 for "hazardous use", 16-19 for "harmful use" and > 20 for "likely dependency" (239). The outcome variable in our study was binary with a cut off at 16, as this would estimate the proportion of women with likely harmful alcohol use or dependency. However, it is important to underline, that AUDIT should be accompanied by a clinical assessment if any definitive diagnosis to be made. Women who reported no alcohol consumption during the last year, did not complete the AUDIT as their total score would not exceed 6 and thus would belong to the low-risk group without the need for any further assessment.

Disengagement with PrEP services (paper II) was defined as not attending the first follow-up appointment. This was typically scheduled one month after baseline/PrEP initiation. We allowed for a delay of another month before registering the user as having disengaged early (28 + 28 days =56 days after initiation). This was a pragmatic cut off, similar to what has been used in other studies (102, 103).

Exposures and adjustment variables:

The main exposure variables examined as part of this study were age, gender-based violence, arrest/incarceration, sex work mobility, female sex worker stigma, social support, mental distress, number of clients/month and condom use. It should also be noted that harmful alcohol use which was the outcome variable in paper I, was included as an exposure variable in paper II, as we were interested in examining if harmful alcohol use was associated with disengagement in care in our study. In table 6 we have outlined each exposure and how it was measured.

Table 6: Exposure variables for each paper and how they were measured

Exposures	Tools and questions	Paper I Exposure of interest	Paper II Exposure of interest
Age	Single question: "How old are you"		x
Gender-based violence	Two questions merged: "Have you experienced physical violence (like being beaten) during the last 12 months?" and "Have you been forced to have sex during the last six months?" Answering "Yes" to one or both were registered as positive for GBV.	x	
Arrest/incarceration	Single question: "Have you been arrested by the police the last 12 months?"	x	
Mobility	Single question: "Within the last 6 months have you ever travelled to another city or county to perform sex work?"	x	x
Sex work stigma	13-item scale (score range 13-52) previously validated for female sex workers (240). Includes statements such as "People's attitudes about sex workers makes you feel worse about yourself". Four-point Likert scale ranging from "strongly agree to strongly disagree".	x	
Social support	The Duke UNC-Functional Social Support Questionnaire (234) is an eight statement scale with questions such as: I have people that cares about me". Answer options on a five-point Likert scale from "Much less than I would like" to "As much as I would like" (range 1-5), higher scores indicating more support.	x	
Mental distress	Positive screen for the Patient Health Questionnaire 2 (PHQ-2) (235) measuring depressive symptoms using two screening questions and/or a positive screen for anxiety disorder using the 2-item questionnaire Generalized Anxiety Disorder-2 (GAD-2). (236). Both questionnaires asks about frequency of symptoms in the last 2 weeks, with answer options ranging from "not at all" (0 points) to "nearly every day" (3 points).		x
Harmful alcohol use	AUDIT as previously outlined (239)		x
Condom use	Single question: "Did you use a condom the last time you had vaginal sex with a client?"		x
Sexual (client) partners	Single question: "In the past one month: how many clients did you have vaginal sexual intercourse with?"		x
Self-perceived HIV risk	Single question: "What do you think is your risk of HIV infection?" Responses categorized into "high", "medium/low/no" and "don't know".		x

All scales were dichotomized according to scale properties, as pre-defined by former studies or clinical practice. For instance, a total score of 3 or above in the PHQ-2 (235) or GAD-2 (236) equalled a positive screen. For those that did not have a predefined cut off based on former research, we dichotomized at the median.

Variables, that were considered potential control variables based on former research and theoretical assumptions about relationships, were education, marital status, monthly income from sex work, other work besides sex work, number of years since the participant first sold sex (<5 years or ≥5 years) and any lifetime drug use. Additionally, some of the exposures in one model were considered control variables in other models. For more details of the assumptions regarding relationships in each model, see the analysis section and DAGs in the appendices.

5.2.5 Analysis

Descriptive statistics were calculated by estimating proportions for categorical variables, and medians with interquartile ranges (IQR) for continuous variables. In line with RDS we weighted the sample to get more representative estimates of population proportions, as participants with larger networks are more likely to be overrepresented. The weights were calculated a using Stata syntax developed by Schonlau & Liebau (223) that takes this into account. We present both weighted and unweighted estimates of sample proportions.

To analyse associations between exposures and outcomes, we first conducted chi square tests (categorical variables), and bivariate regression, to obtain unadjusted estimates for each exposure-outcome pair. We proceeded building multivariable logistic models for each of the exposure-outcome pairs with the aim of measuring the independent effect of the exposure on the outcome. In paper I on harmful alcohol use, we estimated the independent effect for three of the five exposures that had shown significance in the bivariate analysis (significance level set at 5%): arrest/incarceration, GBV and mobility, while in paper II on discontinuation of PrEP we estimated the independent effects of all pre-defined exposures.

We based our adjustment variables on existing literature and plausible assumptions about relationships between factors and used these to construct Directed Acyclic Graphs (DAGs) as recommended in the methodology literature (241). In short, DAGs serve as a tool in variable adjustment selection, especially when seeking to estimate an exposure's effect on an outcome

(242). There is a need for caution when interpreting the estimates of effect due to lack of temporality, particularly in paper I that only used baseline data. In paper II however, the outcome was measured at a later time-point (disengagement at month 1), which makes inference between exposures and outcome possible, but the direction of effect between the other exploratory variables (exposure and potential confounders or mediators) were all measured at baseline, and thus the direction of effect is not given. This is also the reason why the papers consequently refer to associations, and not causation.

DAGs are still a useful way to assess associations in epidemiological studies, and it avoids the "table 2 fallacy" (243) commonly encountered in much public health literature, where two or more coefficients in one single multivariable model are interpreted as estimates of meaningful effects when they might not be (243). We used the software tool DAGitty (244) to aid in drawing the DAGs. An example of one of the DAGs for paper II is illustrated in figure 4. The circle with "I" stand for outcome: disengagement, the yellow circle is the exposure of interest for this multivariable analysis: "mobility". The arrow between mobility and disengagement is a (hypothesized) causal path. We then included other factors that were likely to have a relationship with either the outcome or the exposure in the DAG. For example, social support and SES (sociodemographic characteristics -> marital status, education and income) were assumed to impact both mobility and disengagement, and thus potential confounders. GBV in one of the blue circles was considered a mediator and should typically not be controlled for. This is because the arrow goes from the exposure "mobility" to "GBV" (and not the other way around) as we based our assumption on longitudinal research that has shown that short-term mobility increase risk of GBV among female sex workers (245). Due to the many potential confounders in the models, which could lead to large adjustment sets and possibility for multicollinearity, we employed a modelling strategy in paper II further that reduced the number of adjustment variables. This was based on a reduction in the mean square error of the effect measure coefficient, combining bias and variance considerations (241). In paper I we used a pragmatic cut-off of significance level at 0.2 to decide if potential confounders would be included in the final adjustment set for each model. Age was included as a control variable for all analyses.

Given that the outcomes in both papers were common, the odd ratios (OR), obtained from logistic regression, would have overestimated the relative risk (RR) if interpreted similarly (246). Consecutively we used marginal standardization to calculate crude and adjusted prevalence ratios (PR and aPR) in paper I and crude and adjusted relative risks (RR and aRR)

in paper II (246). All analysis of effects and associations were performed using unweighted data as this approach been shown to be less susceptible to bias (247, 248). All analyses were conducted using STATA/SE V.16.0.

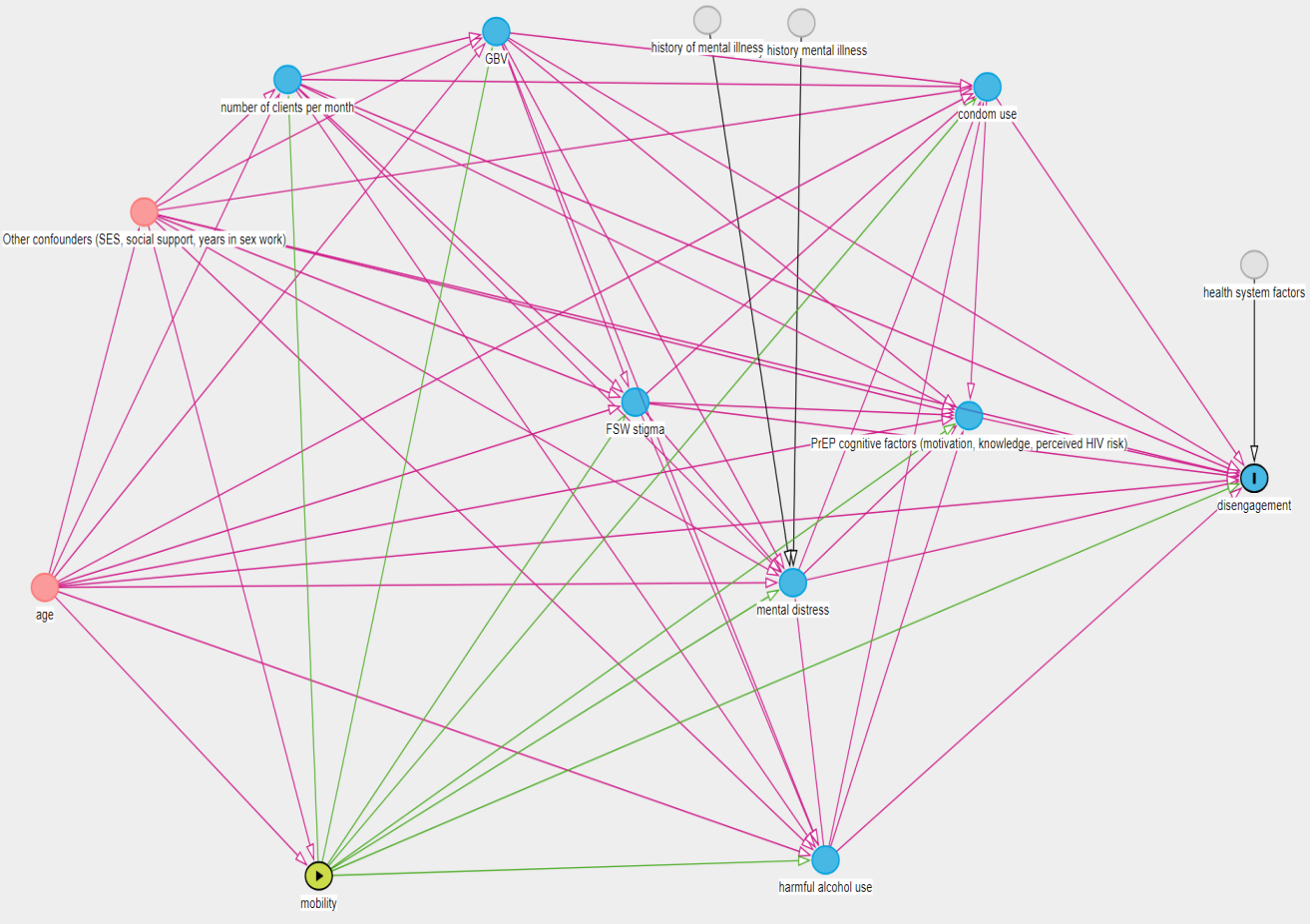

Figure 4: Directed Acyclic Graph for the relationship between mobility and disengagement. Drawn using dagitty.net (244)

5.3 The qualitative component

This study sought to investigate PrEP use from different perspectives, and one important aspect was to get an in-depth understanding of perceptions and subjective experiences with PrEP from female sex workers themselves. Qualitative methodology was well suited to answer this research question, as it "give strategies for exploring experiences, practices, and phenomena in sociocultural words" (249 p. 322).

5.3.1 Recruitment and Sampling

We recruited a total of 40 participants and conducted 46 in-depth qualitative interviews. All participants were female sex workers above 18 years. They were recruited from January 2021 to February 2022, in three different phases. We used "purposive sampling" (249), with the aim of gaining insight into the *diversity* of perceptions and experiences that the introduction of PrEP lead to. We sampled based on PrEP use, including both those who showed up for clinical visits indicating continued use, and those who did not attend visits at the scheduled time. Women were also included based on ensuring a diversity in age. The women were either invited to the in-depth interviews when attending the field site, or through telephone.

The first phase started in January 2021, before recruitment to the quantitative part of the "mother-study" had started. Five female sex workers were invited with the assistance of a peer-educator to take part in interviews, as they were assumed to have experience with PrEP. The second phase was between March and August 2021. The participants where then participants of the "mother study". The last phase was conducted between January-February 2022. Here the aim was to gain insights into experiences with PrEP after a time with use.

5.3.2 Research process and methods

The qualitative component of this study was a collaborative endeavour. The work started with discussions with the other PhD candidates involved in the project and supervisors relating to what aspects of PrEP could be explored. Here we learned from each other and developed interview guides with topics and a few words which was used as a memory aid during interviews (249).

A colleague and fellow Tanzanian PhD student in PREPTA conducted the first five interviews in January 2021 before my arrival in the field. When the "mother project" started the recruitment of female sex workers, the collaboration was further expanded to include a research assistant. He had a background in sociology and former experiences with research projects with key populations and were thus well positioned to conduct interviews and be a collaborating partner for this component of the study. He attended the training for the mother project with the other field assistants to get an overall understanding of PREPTA, and also had training with my co-supervisor with an extensive background in qualitative methods, as well as from myself. We kept in touch through online meetings and communication by phone before I entered the field in July 2021. Between March 2021 and July 2021 the research assistant conducted

interviews on his own while I provided regular input. Later, we jointly conducted interviews, during which he also served as a translator.

The main method used throughout the qualitative phase was in-depth interviews. This was chosen as it is a good way to get participants own views and reflections on a topic. As outlined by Moen et al (249), the interview consists of not only the interviewer and the interviewee, but also the theme, in my study PrEP and HIV, and can thus be regarded as a three-sided relationship (249) The interview guide was used to remind us about sub-topics that *could* be explored, however, it was not used in a structured way (moving from topic to topic in a strict manner). Instead the focus in the interview setting was to make the participant comfortable, so that the participants had the possibility to talk about the topics they deemed meaningful, giving room for them to tell their stories and engage in conversation, following the "trail" of the participant, rather than being restricted by pre formulated questions.

The length of the interviews varied from less than half an hour to more than two hours. They were recorded using the Dictaphone app (250) developed by the University of Oslo as a secure way to record and store interviews (encrypted) and upload them in an encrypted form to TSD (227). Two of the interviews failed to upload, where we instead wrote notes of the interviews.

Once uploaded to TSD, the research assistant transcribed the interviews in Swahili. They were further translated to English, except for some of the interviews that he directly translated to English while listening to the recordings. As fieldwork progressed, I reviewed the transcriptions and throughout the process jotted down ideas, observations and what I regarded as possible themes. As such the analytic process was a continuous endeavour which will be detailed more in the next section.

In addition to conducting in-depth interviews I made regular visits to the study site in the period I stayed in Tanzania, which was about a total of 5 months between July 2021 and February 2022. I usually did not stay at the site long, as work was progressing in the clinic, and I wanted the participants who were there for survey interviews as part of the "mother study" to not feel disturbed by my presence. However, I frequently visited the site when my field assistant had been informed that someone was interested in being interviewed after communicating with field staff, and from there we sometimes walked together to the office where we conducted the interviews. This provided me with an opportunity to observe how the participants engaged with the staff and each other at the site. I was also able to notice their appearances and their clothing, and it gave me an opportunity to engage in informal conversations with the women in basic

Swahili and to observe how they related to me, aiming at making them comfortable, thus reducing the divide between researcher and participant. I further wrote down notes and ideas during fieldwork and discussed these with supervisors and fellow researchers as a way to engage with the data. All data was uploaded to the secure storage platform TSD.

5.3.3 Analysis

The analysis of the qualitative data was guided by a mix of inductive and deductive inquiry, as such it might be referred to as abductive (219). It was inductive in the sense that I was open to new ideas and perspectives coming from participants and co-researchers, and I did not predefine any themes, as these entities that would be co-produced through interviews and the analytic process. But the inquiry was informed by knowledge and literature, including different critical theoretical perspectives, as outlined under the section on theoretical inspiration. One of these was the understanding that practices, including prevention practices, often are influenced by social drivers (factors outside our control such as structural determinants, but that humans through social bonds and networks are able to exert agency). Because of my background I was interested in their social lives, as a way to get access to how PrEP might change their lived realities. However, much of the literature, concept or theories were not defined before the study commenced, but rather went into a dialogue with the the study as it moved along.

Reflexive thematic analysis as described by Braun & Clarke guided the analytic steps (251, 252). This is an iterative process where the researcher moves between different analytic steps in a reflexive fashion as opposed to a linear way. The aim is to end up with overall "themes" that represent "*patterns of shared meaning"* (252 p. 331). Reflexive thematic analysis is not grounded in one ontology or epistemology, but is compatible with a range of ways to understand the world and/or knowledge production. Inspiration was drawn from interpretative/hermeneutic phenomenology which is occupied with understanding a phenomenon in the world through lived experience of people (220). As such we were interested in what this experience meant, both what was experienced and how it was experienced. This also included how PrEP was perceived or experienced in the *mind* of participants, even before use. Interpretative phenomenology first described by Heidegger differs from transcendental phenomenology (its' predecessor) as it is not mainly descriptive, but it acknowledges human beings as "knowers of a phenomenon" (220). It focuses on the lifeworld's of people, the idea that people's realities are consistently influenced by the world they live, and this conscious experience is not separate from "reality" (220). Given this, it is neither achievable nor it

desirable for either the participant or the researcher to detach themselves from the world to understand a phenomenon. Instead understanding must be sought through interpretative means, such as through the use of theories and reflection, considering how the data contributes to understanding PrEP. *Familiarisation* (252) with the data started from the beginning of the study and included the ideas and thoughts that came from the interview situation itself, and from reading and re-reading the transcripts and the discussion with fellow researchers. The process of generating initial *codes* (252) also started early. These were small meaning units which sought to give descriptions of aspects of women's everyday life. The coding was initially done in an inductive and explorative manner (i.e. we did not have a predefined analytic question which narrowed my inquiry and were not aiming to analyse the data in relation to any specific theory or hypothesis, except for the overall notion of having an interest in "the social" and off course the study topic PrEP). This meant that some of the codes did not directly relate to PrEP, but was about other aspects of life, such as "HIV testing is normal" or "Abuse and being tricked". However, as the analysis progressed it became clear that the data material was vast, and that there was a need for an analytic question that could guide further coding and initial development of themes in a clear manner. Inspired by the writing by Whyte et al. (253) and "The Social life of Medicines" we asked the question "how does PrEP act in the lifeworlds of these women including in their minds, bodies and social sphere?" i.e. what kind of *effects* did PrEP have in their lives? We wanted to show the diversity of effects that PrEP could have in women's "lifeworlds" as a way to understand the phenomenon PrEP better. Moving forward codes were refined, and initial themes were developed as the material went into dialogue with different theories and concepts within the public health field: *medicalization, structural violence, medical mistrust, human flourishing and empowerment*. I was also inspired by literature that understood that medicines or other "things" within the medical sphere could be many things at the same time (as understood from different perspectives), such as the writings of Anne Marie Mol: "The Body multiple" (254), and the concept of "Pharmakon" that posits that a pharmaceutical can be "poison" and "remedy" at the same time (255). Several thematic maps were constructed as part of the process of generating themes. For instance some of suggested initial themes "PrEP affects the mind","PrEP affects the body" and PrEP affects the "social" were deemed too broad and captured to many different sub-themes, thus failing to form a coherent theme. Consequently, we had to return to the drawing board and re-evaluate our approach. Although, I was the one conducting the coding, the discussion on themes and how the codes fitted into overall patterns of shared meaning was something that my colleagues

and I had many discussions about. These conversations were crucial in ensuring the cohesiveness and clarity of our qualitative analysis. Finally, we had four main themes which all told a story about what PrEP *did*. The software Nvivo12 was used as an analytical tool to organize the data.

5.4 Ethical considerations:

The study was formally approved by the National Research Ethics Committee (NaTHREC), a part of The National Institute of Medical Research in Tanzania (NIMR), the MUHAS ethical review board in Tanzania and the Regional Committee for Medical and Health Research Ethics (REK) in Norway. As a foreign investigator I also applied for and received a research permit from the Tanzanian Commission for Science and Technology (COSTECH).

Ethical considerations were discussed throughout the study period. In line with the ethical principle of *autonomy* in research studies (256), we ensured that participants were well informed about the study and were free to make their own decision regarding participation. This was done by several mechanisms: by including representatives for the groups themselves in the field staff and recruitment conducted through peers who then spread the word about the research and could provide information and answer questions about participation. When potential participants arrived at the study site, they were informed about the study aim and proceedings by field staff including the voluntary nature of participating. If they were deemed eligible and agreed to participate, they gave written informed consent (consent form attached in Appendices).

Secondly, potential harm to any participant should be minimized, in line with the principle of *nonmaleficence*, in health research studies (256). It was of high importance to ensure the confidentiality of our participants, and to collect data that was stored securely. Given the legislation, the political situation, and the low acceptance of key populations in some sphere of society, this was especially important. We therefore used the TSD storage platform (227) developed by the University of Oslo that made sure that data could be uploaded securely after the interview was being conducted. We did not store questionnaire data or qualitative data on paper. Only three people in the whole research team, one senior researcher, one junior researcher and the data manager, had access to personal identifiable information on participants. We also recorded and uploaded all the sound-files in encrypted form to TSD using the "Nettskjema dictaphone app" (250). The study was conducted in a safe space within a gated

compound, and there were no signs or indication on the site that would suggest that this was a study conducted among key population groups.

Another important ethical consideration was asymmetry in power between research participant and the study personnel, and how to minimize this to further ensure nonmaleficence. As participants were individuals belonging to key populations, who due to stigmatization and criminalization can find themselves in especially vulnerable positions, we conducted thorough training with the field staff on sensitive communication and how important it was to make the participants feel welcomed, non-stigmatized and comfortable. I also often reflected on my own position and my presence at the field site. For instance, before having qualitative interviews I often walked together with participants to the office where we conducted the interview, and then talked a bit with them with my broken Swahili. This seemed to have the effect of making participants more relaxed and diminish some of the asymmetry between us. Throughout the research period there was also continuous effort to bring forward perspectives that considered female sex workers as valuable and full human beings.

Considering key populations' particular vulnerable position in society, the justification for their inclusion into a research study needs to be clear. In our study the inclusion of these groups was paramount, as the intervention of the mother-study (mHealth) and the follow-up conducted relating to PrEP, was directly relating to the need for better HIV prevention services for this group. In line with the principle of *justice* in research, it is also important to highlight the ethical responsibility that the research community has in conducting research focusing on problems and solutions for these groups as they are disproportionately affected by HIV. Furthering this commitment, I made a priority to regularly attend the annual national MUHAS conference regularly, where I had the opportunity to present results as the study progressed. This has been a way to disseminate knowledge about this group to local and national researchers, medical personnel, and others with the hope to dismantle potential preconceptions and recommend strategies to improve female sex workers health, ultimately striving for *beneficence and justice*, (256), that the sex workers themselves will benefit from the research promoting equity for this group of women. Dissemination has also taken place in other conferences and through teaching and publications, and I have also been invited to present the results at the Norwegian Agency for development Cooperation (NORAD) this year.

6.0 Summary of results

The following section presents a synopsis of the results of the three papers and how these correspond to the main objective, to investigate usage of PrEP and disengagement from PrEP services among female sex workers in Dar es Salaam, using a socio-ecological approach.

Paper I: Harmful alcohol use and associated socio-structural factors among female sex workers initiating PrEP in Dar es Salaam

This paper aimed to estimate the extent of harmful alcohol use among female sex workers in Dar es Salaam, and its' association with socio-structural factors. The focus on alcohol was in line with hypothesis that harmful alcohol use could affect disengagement with PrEP services, which was examined in paper II.

A total of 470 women who initiated PrEP, were included in the study. Weighted descriptive statistics estimated a median age of 25 years (IQR: 22-29), about three fourths had never been married (75.8%) and a majority reported to have completed primary education (90.2%). The median monthly income from sex work was 300 000 TSh (≈130 USD at the time) and the median number of sex work clients per month (vaginal sex) were 15 (IQR: 6-30). The median sex worker stigma score was 31 (score range 13-52), social support score was 3.4 (score range 1-5), 43.7% of women had experienced GBV the past 12 months, 20.6% had been arrested the last 12 months and of these about half (54.7%) had been arrested for selling sex. Mobility for sex work in the last six months was reported by 28.4% participants.

Estimates of the extent of alcohol use showed that 82.1% had drunk alcohol the last year, with about half (53.6%) having been drinking at last sexual encounter with a client. Presenting three of the questions in the shorter version of AUDIT, AUDIT-C, we found that a third (34.9%) reported to drink 4 or more times a week, and almost two thirds (65.9%) drank more than 5 alcohol units on a typical "drinking day". A total of 42.9% were estimated to binge drink weekly and 11.2 % daily (drinking ≥ 6 units on one occasion).

The estimated weighted proportion with harmful alcohol use (AUDIT ≥16) was 37.3%. In multivariable logistic regression analysis with marginal standardization, harmful alcohol use was found to be independently associated with:

- Arrest/incarceration last 12 months: PR 1.72 (95% CI: 1.45-2.04) and aPR 1.55 (95% CI 1.27-1.84, $p<0.01$)

- Gender-based violence last 12 months: PR 1.63 (95% CI: 1.33-1.98) and aPR 1.31 (95% CI 1.06-1.56, p<0.01)
- Sex work related mobility last 6 months: PR 1.39 (95% CI: 1.16-1.66) and aPR 1.36 (95% CI 1.11-1.61, p<0.01)

In conclusion, harmful alcohol use was highly prevalent among female sex workers in Dar es Salaam who initiated PrEP and this was independently associated with socio-structural vulnerabilities such as being arrested, experiencing GBV and mobility due to sex work.

Paper II: Early disengagement with PrEP services among female sex workers and associated factors using a socio-ecological framework

This paper aimed to estimate the proportion of women who were disengaged with PrEP services at first monthly clinical follow up, and factors associated with disengagement situated at different "layers of the socio-ecological model". The factors investigated were age and self-perceived HIV (individual level), psychosocial factors: poor mental health and alcohol use (individual level), condom use last sex and number of partners/month (interpersonal/network-level), sex work stigma (community-level) and mobility for sex work (structural level), and their association with early disengagement with PrEP services among female sex workers.

We found that of the 470 women enrolled in the study, 340 (74.6% weighted) did not attend the first follow up visit (within 56 days of enrolment).

In multivariable logistic regression models with marginal standardization, younger age, lower number of sexual partners and mental distress were independently associated with disengagement at month 1. Women being 35 years or older had 25% reduced risk of disengagement (RR =0.75, 95% CI: 0.56-0.95, p=0.010) compared to women 18-25 years of age. Participants with mental distress (positive screen for GAD-2 and/or PHQ-2) had an aRR of 1.14 (95% CI 1.03-1.28, p=0.019) compared to those with a negative mental distress screen. Compared to those who had less than 10 clients/month, female sex workers with 30 or more clients during a month, had a 20 % reduced risk (aRR: 0.80, 95% CI: 0.68-0.91, p=0.003), while those with between 10-29 clients had a 13% reduced risk (aRR: 0.87, 95% CI: 0.76.-0.98, p=0.048) of disengagement from the services.

This paper concluded that early disengagement from the PrEP services was high, and that disengagement was associated with mental distress, being younger, and having fewer sex work

clients. Harmful alcohol use that we had hypothesized to be an influencing factor was not associated with early disengagement.

Paper III: What can PrEP do for female sex workers? – unpacking the "effectosphere" of biomedical HIV prevention in Dar es Salaam

The aim of this article was to understand what PrEP *did* in the mind, lives and bodies of female sex workers that were either considering use, were using or had stopped using PrEP. Through in-depth interviews with participants and prolonged engagement in the field, and through reflexive thematic analysis, we found that PrEP had multiple, diverse and sometimes ambiguous perceived effects for the women. These findings were divided into three central themes: 1. PrEP could promote human flourishing and empowerment, by improving business and generate more income. It could make HIV fear fade or disappear and could induce confidence which had the power to transform into healthier practices, as well as instilling a sense of being seen and cared for. 2. PrEP could inflict physical harm (and fears of such harms), as there were speculation that PrEP was being used to hurt sex workers intentionally, and these perceptions seemed to reflect experienced side-effects and how some participants perceived society's view of them. 3. PrEP could expose sensitive information, about HIV status and line of work, and it could generate false information about HIV status because PrEP pills and packaging were thought to be ART and the daily intake schedule resembled ART treatment regimens. This could lead to stigma, need for elaborate explanations and for hiding medication as well as potential to elicit consequences for social relationships. 4. Finally PrEP had the potential to medicalize life, through its requirement of daily pill taking, clinical visits, its' side-effects, and becoming a person "at risk", which set users up for failure when instructions were too difficult to align with everyday life.

We referred to the diverse and multiple effects of PrEP as the "effectosphere" of PrEP, as a way to draw attention to the myriad of things that a biomedical intervention can do, in addition to the anticipated medical effect, a term we suggest can be used in relation to other biomedical interventions as well. The paper shows that PrEP is a complex intervention, not "just a pill", and it provides some explanation for why PrEP engagement, both when it comes to pill taking and adhering to clinical visit is not easy

7.0 Methodological considerations

In this chapter, important methodological considerations for the study will be discussed. The quantitative and the qualitative component will be presented separately as they rely on different concepts and judgements to assess aspects of quality and accuracy.

7.1 The quantitative component:

7.1.1 Design and data sources

The quantitative component was designed to measure the proportion of two outcomes: harmful alcohol use (paper I) and disengagement with PrEP care (paper II), as well as estimating associations. Cross sectional survey data (paper I) and longitudinal follow-up data (paper II) are well suited for these objectives. With a cross-sectional design in the first paper, exposure and outcome were measured at the same time point, while making causal inferences necessitates the cause preceding the effect. The associations between harmful alcohol use and the exposures, could thus also be a result of reverse causation, for instance that harmful alcohol use lead to increased risk of being arrested. Thus we have been consistent with using the term associations in the study, and regarded the analysis as exploratory with regards to potential causal relationships. In observational studies in general, even in the case with longitudinal data (paper II), one should be cautious about making causal inferences due to the risk of systematic bias, which I will discuss further.

7.1.2 Definition of exposures and confounder variables

We defined the exposures for each sub-study in relation to the overall objective; in the first paper we examined the association between harmful alcohol use and socio-structural factors: stigma, incarceration, mobility, GBV and low social support. In the second paper, we included exposures on all layers of the socio-ecological model. The exposures were measured through self-report and questionnaire data, which for these exposures were deemed to be appropriate. For an exposure like stigma, which is a multifaceted concept, we utilized a sex worker stigma scale which used several statements to assess the degree of stigma. Composite scales were also used to measure other constructs such as social support. Continuous variables and scale variables were categorized, including the stigma scale which was dichotomized at the median. Although one of the drawbacks of this approach is that statistical power is decreased (257), it

can enable better understanding and increases applicability of the results in a clinical or policy setting (257). Most of the exposures were originally categorical and most scales used had well defined cut-offs points based clinical significance as established in the literature (235, 236, 258).

Through the utilization of directed acyclic graphs (DAGs) (259) we derived at effect estimates for each exposure-outcome pair, as these were modelled in turn, adjusting for potential confounders. This avoided what is commonly referred to as the table 2 fallacy where all exposures are included in one model only (often referred to as table 2 in papers), and where all the generated coefficients are interpreted as estimates for meaningful effects (243). For instance, in paper II, sex work stigma was considered a potential confounder (a factor that might impact both the outcome and the exposure) in the relationship between condom use and disengagement with PrEP, as stigma has been found to influence condom use (260). However, in the next model, when examining the relationship between age and disengagement with care, FSW stigma was as illustrated in the DAG, deemed to be a mediator (i.e. that age could affect the level of stigma, not the other way around). Since we were interested in the total effect of age on disengagement, no adjustment was necessary. There are however uncertainties about some of the assumptions, as in many epidemiological studies. We have therefore made sure to be transparent and have presented the confounders adjusted for in each analysis, and also presented the DAGs in the appendices.

7.1.3 Reliability

Reliability refers to a study being able to measure something consistently (261). First we ensured a large enough sample size and enough power (80%) to ensure precision. It is important to note however, that my study was dependent on the mother study's sample size estimation which intended to assess a different outcome. To ensure a sufficient sample size for the analyses conducted in paper I and II, sample size calculations were conducted based on single proportion formulas, using the proportion of the outcomes (harmful alcohol use and disengagement with PrEP care), which underscored that the sample size was sufficient. As this study was also assessing associations, which included the use of multivariable models, we followed "the rule of thumb", that there should at least be 10 observations for every term in the regression model (262). This is to avoid overfitting which means that it is too heavily influenced by random error (262). Confidence intervals are also presented for all effect estimates, which were not large, underlying sufficient precision.

Other factors which could have affected reliability, such as measurement error, was related to the questionnaire and the execution of the survey. To minimize this risk, the questionnaire was developed in a collaborative manner where all researchers were involved. The questionnaire was first developed in English, consequently translated to Swahili by the native Swahili-speaking members of the team. Unfortunately, due to time constrains, back translation was not conducted. However, several of the questions had been used in previous surveys in Tanzania and the questionnaire was pre-tested with field assistants to make sure all questions were clear and concise to increase inter-rater reliability (261). We also conducted training with the field assistants, which included going through the sections of the questionnaire together, focusing on content and interview techniques (such as probing).

We further assessed the internal consistency of the female sex worker stigma scale and the social support scale that were part of the questionnaire, using the Cronbach alpha reliability coefficient (261), that compares the covariance (the amount of variance shared among all the items in the scale) to the overall variance, which were both high (0.88). Internal consistency was also high for responses to the AUDIT questions (α=0.76).

Based on the objectives we chose multivariable logistic regression analysis with marginal standardization. With the analyses of associations with binary outcomes and the need to adjust for several confounders in the final models, logistic regression modelling was the natural choice. We used unweighted data as this has been shown to give less bias than weighted RDS data (247, 248). We used the Hosmer-Lemeshow test (post estimation command) after final model selection, to assess if the data was consistent with the logistic function which it was (263). As logistic regression provides odds ratios, which in circumstances when the outcome is common, will overestimate the effect, we transformed the odds ratios to prevalence ratios and relative risks using marginal standardization (246). This is a standardization technique where predicted probabilities of the outcome are calculated for every confounder value, combined to a weighted average for each exposure level (246).

We assessed missing data in all analyses. For the outcomes there were no missing data, and for the exposure and/or confounder variables the percentage of missing was less than 5% which made complete case analyses a reliable method (264).

7.1.4 Validity

Validity refers to how much we can trust the study findings, and is related to limited systematic error (internal validity) and to what extent the findings can be generalized to the source population (external validity). Confounding is one source of systematic error (or bias) (262), which we sought to mitigate as best we could as described above. Other types of biases can be classified into *information bias* and *selection bias* (262).

Information bias can threaten the internal validity of the findings if information gathered are erroneous for different reasons. One form of this bias is *social desirability bias* (261), which is likely in studies where participants need to report on sensitive behaviours such as sexuality practices and substance use. We trained the field assistants on sensitive communication with participants to mitigate this. Our findings show that a high proportion of respondents confirmed different sensitive behaviour (anal sex, non-condom use, harmful drinking, incarceration), which might indicate that this was less of a problem in our study. Other types of information bias can be related to the instruments used, such as if the survey questions were unclear or that scales did not measure the construct they were supposed to measure (*content and construct validity)* (261). We included questions that had been used in the study area before, and scales that had been validated previously, as we did not have the possibility to conduct validation studies beforehand. We also pretested the questionnaire and made adjustments accordingly. During the course of the mother-study, we further discussed a couple of questions where we became unsure about their validity due to new acquired information (see example below on sex worker typology). These were not questions used in any of the analysis in this study. Recall bias were deemed to be less of an issue, as most questions were related to current situation or near past.

Content and construct validity is also especially important for the two main outcomes: harmful alcohol use and disengagement with PrEP services. For harmful alcohol use we used a well-known instrument that has been utilized in a myriad of settings to measure alcohol use that indicates problematic consumption and in severe cases dependency (258). Despite likely cultural differences in alcohol practices (i.e. what may be deemed problematic drinking in different context), the increased evidence relating to alcohol's impact on hard end points such as morbidity and mortality (60), justifies the use of this instrument in a variety of contexts. We deliberately did not distinguish between harmful alcohol use and dependency, because judgement regarding differentiation these conditions would require additional clinical

assessment (258). We further used a Swahili version with only small amendments in wording (238). Any misclassification of study variables (for instance under-reporting of alcohol use), was likely non-differential, meaning they would be expected to have biased the effect estimates towards the null (262).

Another type of systematic error is *selection bias*, which relate to how participants were selected to the study. The study was conducted using respondent driven sampling (RDS). Due to criminalization and stigma, and the lack of a sampling frame, it can be hard to get representative samples from key population groups. RDS is a proposed strategy that relies on a modified snowball-technique commonly employed in social sciences, uses a weight to derive at population estimates. Although RDS is somewhat regarded as a probability sampling strategy, we encountered some challenges as is common with RDS (265). Firstly, we aimed at having a diversity with regards to socio-demographic characteristics and sex-worker typology (i.e. where they solicited clients from), but the latter category seemed to be more fluid in our context. One of the seeds had for instance informed us that she was street-based during recruitment, but in the quantitative survey reported to (mainly) work from bars, as did the majority of participants in our study. This means that the study findings might not as easily be representative for those who were only street-based or escorts, but it also indicates as already mentioned that these typologies might not be mutually exclusive (that at least some sex workers work from both bars and street, or both bars and brothels).

One of the objectives in RDS is to get long enough recruitment waves, so that the final sample is independent of the selected seed, i.e. that the estimates do not change much from wave to wave. In our study, one seed did not recruit, and another only had one recruitment chain, similar to other RDS studies (265). We added more seeds which is one way to mitigate for this, and of the other 7 seeds, recruitment waves were 5 or longer (max 14, median 9). It is usually said that 6 waves should be reached to ensure random selection (265). Furthermore, we learned in the qualitative interviews that at least one of the seeds might not have recruited participants herself, and there seemed to have been some interference from some study staff that could have impacted on the way recruitment was conducted. This could have affected that particular recruitment chain, but as this information was acquired at a later stage in the study, we could not make any changes. In a sensitivity analysis, removing all participants recruited by this seed, this did not however seem to have much impact on the proportion of harmful alcohol use (unweighted 48.0% in sensitivity analysis vs. 48.9% in original), nor the conclusions as prevalence ratios were: GBV 1.33 vs. 1.31, arrest/incarceration: 1.52 vs. 1.55 and for mobility

1.47 vs. 1.36, the latter factor just indicating a bit stronger association when removing all participants from this seed.

Secondly, the average income was 300 000 TSh (≈ 130 USD) from sex work per month, while only 24 participants reported to earn more than 1 000 000 Tsh (≈ 430 USD), and only two reported earning more than 2 000 000/month (≈ 860 USD). This indicates that we did not to a large extent reach the top income quintiles, while it is obvious that sex workers from these socioeconomic strata exits when frequenting high end bars and establishments in Dar es Salaam. It is however not known what proportion they make up of the total number of sex workers in the country, and if they even would define themselves as sex workers and thus join a study like ours. On the other end of the socioeconomic spectrum, there is also a need for some caution when regarding generalizability as, due to the mother-study's overall aim, to test a mHealth app, we might not have reached the poorest female sex workers as access to a smartphone was an eligibility criterion for study participation. However, mobile usage and internet ownership have increased in Tanzania, and in 2021 there were 85 mobile subscriptions per inhabitant (266). Additionally, we did have a substantial proportion of participants earning low incomes from sex work included in the study (≈10% earning only 40 USD from sex work per month).

Thirdly, it cannot be ruled out that some aspects of the study design might have overestimated the early disengagement rate in our context compared to other contexts where PrEP is initiated in a classic clinical setting with self-referral. The study procedures took more time which might have discouraged return. Some of the women also explained in qualitative interviews that they had not been aware of the study aim before they came to the study site which might mean that more women said yes to start PrEP without having reflected enough about what PrEP use and participation in the study entailed. The incentive that is given as part of an RDS study could also be a motivating factor to join for some, although only one participant confirmed this to be the case in the survey. However, high self-perceived HIV risk was reported by two quarters of participants, one important motivational aspect of PrEP use, and the clinic did assess motivation for starting PrEP before initiation. Finally, although owning a smartphone was not a prerequisite for PrEP use, the recruitment process included peers asking if participants owned a smartphone, and a few qualitative accounts indicated that some had misunderstood and thought that they needed to still have a smartphone when they returned for clinical follow-up. Although participants were called for follow up if they did not meet, and this was explained when we understood it could be an issue, some participants might have been missed due to this

fact. We however do not consider that the mHealth app had any substantial negative effect in this regard, as (unpublished) evidence point high disengagement in the control site of the mother study in Tanga, where no app was introduced and owning a smartphone was not an eligibility criteria. In fact, optimal use of the app in Dar es Salaam was associated with increased engagement in care (267).

As outlined above there were some challenges with using RDS which we sought to mitigate as far as we could. The estimates are likely closer to population estimates than a convenience sample or clinical sample would have generated, however there is some need to be cautious about the generalizability of the study findings.

On a final note, it is important to mention that there were likely other factors that could have been associated with disengagement, which we did not investigate. However no study can investigate *all* possible relevant exposures for PrEP disengagement quantitatively, due to the complexity of building models for each exposure and outcome. We therefore had to make some choices and selected seven factors based on relevant literature, and because we wanted to explore factors situated at different layers of the socio-ecological model. Further studies might be undertaken to investigate other factors.

7.2 The qualitative component

Guided by Moen et al. (249) and Moser & Korstjens's practical guidance to qualitative research (268), the qualitative component will be discussed. Some of the aspects will only be briefly touched upon as they have been elaborated on as part of the method section, such as epistemic values.

Moser & Korstjen's address quality through the concept of *trusthworthiness* of the research. This includes *credibility*, *transferability*, *dependability* and *confirmability*. *Reflexivity* is additionally highly important as a part of transparency of the research endeavour.

7.2.1 Credibility

Credibility relates to the plausibility that the findings are true, that the conclusions are drawn from the original data and represents an accurate picture of participant's perceptions (268). We strived to create a credible analysis by doing a number of things throughout fieldwork and analysis. This included spending considerable time in the field (five months), getting familiar with the context, including visiting venues (bars and brothel) where sex workers operated, and

utilizing both interviews and observations (triangulation of data). Nevertheless, the many in-depth interviews we conducted, and the sites I did visit, and combined with the quantitative data did provide me with a good understanding of the context in which they lived. Although we assessed that five months of fieldwork and 46 interviews were sufficient to answer the objectives of the study and conduct a credible analysis about important things PrEP could do in the women's lives, many other aspects of their lives and circumstances could potentially have been explored if the fieldwork had been longer.

Credibility have also been enhanced through the collaborative efforts with supervisors, the other PhD candidates and the field assistant. This collaboration ensured continuously getting other people's perspectives on the findings, being asked critical questions and learning from colleagues, many who have long experience with the circumstances for key populations in Dar es Salaam. The field assistant further checked that the findings resonated with his experience of the interviews. As analysis was finalized when I was already back in Norway, I did not have the opportunity to do member checks with female sex workers themselves, which could have further added to the credibility of the study.

7.2.2 Transferability

Qualitative research is not aimed to be generalizable in the same sense as quantitative studies. However, it can be relevant in other settings than where it came to be formed, the results can be *transferable*, through the development of concepts or theories (249) and through the use of "thick descriptions" (268). We aimed, through detailed accounts of the field and context, and the women's lives, to make our findings understandable for readers in other locations, for instance how a pill like PrEP could be perceived as harmful.

Even the term effectosphere may be an example of a finding that could travel and exhibit relevance in other contexts. We see this as a concept that emphasize the diverse and multiple effects that biomedical interventions might have in the world, and suggest that the term can increase the understanding of biomedical interventions as something more than just their intended effects.

7.2.3 Dependability and confirmability

Dependability refers to the stability of the findings over time, and that interpretation and recommendation is supported by the data (268), while confirmability refers to what extent the

findings can be confirmed by other researchers (268). To ensure this, throughout the study period there has been documentation of the steps taken, the ideas conceived and analytic process. All data and observations have been included in the Nvivo12 within TSD where the process from the early thoughts about the project and the topics can be followed, to the development of initial codes and themes, and thematic maps. The qualitative research process has as earlier described been collaborative, and although I have conducted the coding and the detailed reading and re-reading of manuscripts, the thematic analysis has been developed, discussed and agreed on with other members of the research team. I have strived towards being open and document the ongoing work, and this has also been supported by the characteristics of PhD research, where supervisors and colleagues have been involved in the research process from the beginning.

The study has also been described in detail in this document and in the qualitative paper, which is also essential part of ensuring that the research is trustworthy. I have covered important aspects of research from researcher position and reflexivity to design (theoretical framework, methodological orientation, participant selection, setting, data collection etc.) to analysis and reporting of themes.

7.2.4 Reflexivity and researcher role

Reflexivity relates to the research process and a researcher attitude that is open and curious, and which seeks to confront own preconceptions. It often means going back and forth between ideas and understandings, and throughout the process question what data means, and aim to see it in new ways (269). In interpretative phenomenology, which guided my analysis, the aim was not to attain an "objective" position, but to account for how one's own position might have influenced the research. And finally if I have been positioned to understand and how the research can transcend perspectives (249).

First, I am a Norwegian female PhD student and a medical doctor who has not grown up in the cultural context I conducted research in. On one side, this has been a strength as much of the experiences and practices that I observed were seen from a more "outsider" point of view, and likely less influenced by tacit knowledge of the society. However, it also meant that I likely missed cultural "codes" and underlying meanings where these were not expressed orally (and translated), as it could have been assumed that I shared those ideas and thus these ideas were not uttered (taken-for granted), or perhaps some ideas were not conveyed to *me* because of who I am; a foreigner, a doctor and not a sex worker. I did however conduct the research in close

collaboration with Tanzanian co-workers, including a trusted field assistant and translator which mitigated some of this. I myself became well acquainted with one of the peer sex workers involved in the project as well, who I also met outside the study site. I also tried to notice how sex workers operated in bars, and other social areas, as a way to position myself to understand more of their life.

As part of this research, I spent about five months in Dar es Salaam doing field work and I attended language class before and during my stay, and thus managed to communicate some in Swahili with participants, which also had the visible effect of creating more closeness and close some of the power gap before the interview, as mentioned earlier. They could laugh of my mistakes, and see that even if I was a foreigner, researcher and a medical doctor (many of the field staff referred to me as doctor) I spoke their language at the same level as a child. Finally, I have lived experience with the region, especially neighbouring Kenya through my marriage, but have also visited Tanzania before the study commenced, which meant that although far from being a local, I did not find it too difficult to fit in, and many referred to me as being Kenyan or Tanzanian due to my middle name, marriage and my attempt at speaking Swahili. As part of a reflective approach, I have aimed to discover and be mindful of my own preconceived ideas. One such preconceived idea was the idea that all female sex workers overall were victimized, a common view held in the western part of the world, in the Norwegian context and to some degree within public health (46). This view has been challenged through the encounters with many assertive women who have shown me the nuances of their life and work and who they are, and through engaging with literature on the topic. I see this as an example of the reflexive approach I have taken to the study, where I have been open to new ways of understanding. Another example is the understanding of PrEP as a preventive strategy. When I started I was grounded in a mainstream public health and in clinical medicine, and were informed by questions such as; “how do we get people to adhere to PrEP?” (hence taken for granted that it is a good preventive strategy for all, or that it is public health “experts” who are the main actors in HIV prevention while clients are the recipients). Throughout the research process I have however started to ask questions based on data, literature and my own experiences that challenged some of these notions, and which opened up the field to a more heterogeneous way of seeing PrEP and how prevention strategies work through collaboration with users themselves.

The openness to other disciplinary fields that I have had throughout my student and professional life, have likely enabled the reflexive approach outlined above. Through

organizational work and my position at the Department of Community Medicine and Global Health at UiO, and my undergraduate training before medical school, I have been acquainted with health and- development theorists such as Freire, Amartya Sen, Paul Farmer (207, 270). Furthermore, during medical school I was part of an interdisciplinary research project where I learned from researchers in the anthropological field. Thus, the social and political sphere of medicine have long been an interest of mine, and the thesis, especially the research questions, and the qualitative analysis were informed by ideas from the social sciences as well as public health.

8.0 Discussion

8.1 Understanding PrEP use and disengagement with services - multiple PrEP *effects* and complex life-circumstances

The high early disengagement in this study aligns with findings from other research conducted among female sex workers in Sub-Saharan Africa. In urban clinics in South Africa, 53% attended their first follow-up visit (119), while 40.3% was seen the first month in a Kenyan study (120). After six months the figure in the Kenyan study had dropped to 14%. In Benin, 47.3% of female sex workers were still enrolled in the program at end study (118). Disengagement at month 1 was higher in Tanzania, estimated at 74.6%. Some of this difference might be attributed to different ways of measuring early disengagement, as in our study the women were screened and enrolled in the same visit, while this was a two-phase process in Benin and South-Africa. The denominator in these studies could therefore have been made up by more motivated individuals than in our study (and thus engaged longer). Despite these differences, several studies show the same trend, that disengagement is high, and that this happens early (118-121). Our study supports this body of evidence, and provide one of the first estimates from sex workers involved in a PrEP service in Tanzania.

So how can this high disengagement be understood? Although cautious with drawing definitive causal inferences, we can draw interpretations from both the quantitative and the qualitative component. PrEP had multiple, diverse and sometimes ambiguous effects for the female sex workers in Dar es Salaam, a finding that resonates with other studies investigating perceptions or use among sex workers (124-126, 128-130). However, this multiplicity and ambiguity is often not made explicit by the authors. With a focus on the effectosphere and the *range* of effects, the aspiration was to avoid dichotomies, as we did not find that this accurately captures the complexity of what a pill like PrEP can do and how it is perceived. One of our findings was that PrEP contributed to medicalization in different ways, i.e. making more of life “medical” (208). In addition to its obvious physical attributes: being a pill for HIV prevention developed and promoted by pharmaceutical companies, clinical medicine and public health, participants found it challenging with daily intake and monthly follow-up visits, being reliant on a medical system, and also sometimes seemingly small details like pill size which made it hard to swallow for some. These self-perceived effects happened alongside the sense of protection it PrEP gave from a condition that could give rise to much concern.

For some participants the aspect of medicalization set them up for failure as it did not align with the realities of their lives, and thus it was difficult to be "compliant". In the updated technical brief to the WHO implementation guidance on PrEP (43), demedicalization of services has been highlighted. This entails community delivery approaches, telehealth and other ways to lessen the burden relating to clinical visits. Additionally measuring kidney function has become an optional recommendation for those below 30 years, while it is stated that lack of hepatitis B and hepatitis C testing should not be a barrier for PrEP initiation (43). The final Tanzanian implementation framework also mentions decentralized approach to service delivery (150). These factors can be one way to mitigate some of the challenges related to medicalization of HIV prevention in relation to PrEP use, and has also been suggested by users themselves (271).

In-depth interviews with participants in our study revealed that PrEP was by some thought to inflict harm. Several of the women explained that this had delayed their own or others initiation of the medication. The idea seemed to partly stem from the fact that actual side-effects were a common occurrence especially at the beginning of use, but for some it seemed to be more deeply rooted in medical mistrust. The idea that PrEP could be manufactured to harm sex workers, even kill them, due to their unacceptable behaviour reflected their status in society and even how some of them viewed themselves. In line with this finding, several women narrated how they were disregarded or mocked by family or other members of the community because of being a sex worker. The quantitative data also indicated high rates of sex work stigma, in line with findings from other studies among sex workers both within Tanzania and elsewhere (6, 29, 260). Underscoring the presence of other socio-structural circumstances in the lives of sex workers which might have made them feel undesired, were the high rates of women reporting being arrested the preceding year (20.6%), mostly for practicing sex work. Crack downs on key populations in Dar es Salaam in recent years have been documented (178), and it should be questioned if a socio-political context with criminalization and stigma can enable trust in health services promoting a relatively new biomedical innovation. The presence of foreign researchers were also brought up by participants with regards to trusting the medication, as has been the case in other HIV study settings (212). Medical mistrust have been evoked in other PrEP studies, for instance in two efficacy trials, the TDF2 study in Botswana and "The Voice" in South Africa where participants expressed concern that the medication actually was exposing people to HIV (82, 272). The presence of medical mistrust illustrates that PrEP cannot be regarded as a neutral biomedical intervention, but that its introduction

needs to be understood in a societal and historical context. Several of the women in our study brought up education of sex workers and the community as an important aspect of dismantling some of these views, and that they themselves had even been challenged or convinced to start PrEP by other sex workers. This points to the importance of building alliances between public health professionals and users, and make sure that implementation of a new prevention is not a one-sided affair run mainly by health authorities, which has also been underlined in the aftermath of the first PrEP trials that received criticism of unethical conduct (70, 71). In our study, we had collaborations with peer educators, which were important especially in the recruitment and follow-up, and in the Tanzanian guidelines the role of peer educators in PrEP implementation is emphasized (150). The focus here is mostly centred on the peer-educator providing basic information on PrEP, and other prevention options, HIV risk, and to support demand creation and adherence and connect the community and the facility (150). As PrEP is being rolled-out, how this collaboration works in practice should further be studied.

The importance of involving sex workers in implementation efforts also became evident when understanding that the use of PrEP could expose sensitive information as illustrated in the qualitative component of the study. Not only did PrEP use necessitate exposing your own HIV status to yourself and potential others, which itself could cause dread as the consequences of being found HIV positive could be dire. But even if found HIV negative, PrEP use could lead to mistakenly being seen as HIV positive. HIV stigma as a result of PrEP use have been documented in several contexts (124, 127), as in ours, and is one of the factors seen to impede adherence and engagement in programs (122). Interestingly, we also found that the connection between PrEP and ART even made someone believe that they were in fact HIV positive, and that the health personnel had tricked them and were treating them for HIV, not prescribing PrEP for prevention. This illustrates how difficult it can be to align the fact that the same pill is used for both treatment and for prevention. Although the conflation between ARV for prevention and ARV for treatment has been described since the early trials of PrEP (82, 273, 274), it should be questioned if sufficient steps to address this have been taken. One suggestion coming from users themselves was to change the packaging of PrEP so it does not resemble the packaging used in ART regimen, which has also been proposed by young women in Malawi (275). We have not found evidence that packaging has been altered with this aim in mind described in the literature to date. In line with the findings of this thesis, it should be considered if community representatives to a greater extent should be involved in the design of services and decisions regarding programming, as they have valuable information on how PrEP

programming might work for them. It can also lead to a more systemic empowerment of female sex workers, as an extension of the empowerment effect of the pill itself. Indeed, community engagement have been important for successful prevention strategies (23, 24).

The diversity of PrEP is not only relevant with regards to its effects, but also in relation to how the pill is used. Although early disengagement was high, measured by quantitative methods as a binary category, this finding alone cannot cover the multiple ways people used PrEP, which is also supported by evidence from other contexts (186). Participants during the qualitative interviews reported for instance using PrEP every day and being strictly adherent to using it some days while forgetting others, stopping for several months, then restarting, while others stopped with no plans of initiating it again. Although, from a biomedical standpoint this might not be desired, it is important to acknowledge that PrEP differs from antiretroviral treatment, with PrEP being a time-limited prevention that depends on current need, rather than being a life-long treatment for chronic conditions (100). Haberer et al. (106) have for instance argued for a "prevention-effective adherence paradigm" that acknowledges that different levels of adherence might be needed according to fluctuating risk. This could have been underlying the higher disengagement among women with fewer clients in our study. Programmatic data, including from Tanzania (186), has also found that although early discontinuation seems to be common, restarting PrEP at a later time is also common, and that it is used with improved consistency when clients get more acquainted with PrEP, which points to the use of PrEP being more dynamically than what routine indicators manages to measure (186). Additionally, oral PrEP is one of several HIV prevention options, and it should be expected that some clients will discontinue PrEP either for a while or indefinitely. In addition to the obvious important focus on how PrEP and its delivery can fit into users' lives in the best way, perhaps should the discussion also be re-centred around PrEP as a prevention *choice*, and less on PrEP and other biotechnologies as a universal solutions to end AIDS (70), including how to get everyone who initiates PrEP, to adhere? This would entail the public health community acknowledging that some PrEP initiators will discontinue PrEP, and not automatically regarding this as a failure of PrEP or programs. This however is not to discount the fact that we now have a very efficient tool for preventing HIV, and that not making this easily accessible would also be a serious error to make. In line with this, it is important to understand both the reported reasons from users themselves (some of which discussed earlier), and other factors or characteristics associated with disengagement, which will be discussed in the following, and ensure that those that can

be amended (or the circumstances that might explain these associations), are put on policy makers agenda.

8.2 PrEP could be a gateway to social change, human flourishing and other health- and social services

Despite much optimism, researchers have long cautioned against the idea that biomedical advances alone can control the HIV epidemic (36, 70). It has been argued that the bio-medicalized turn of HIV prevention, in which biomedical devices such as PrEP, are promoted as the solution to the HIV/Aids crisis, could fail to recognize the importance of the social world that users live in (22, 36). Within these social worlds people interact and influence each other, prevention practices are shaped in a complex interplay with others, and decisions regarding health and health care are not only (or mainly) guided by individual or biological factors (22, 36, 69). In addition to interpersonal factors, more overarching societal structures, such as legislation, policy, and societal norms, can enable or constrain an individual's ability to act (35). With regards to the HIV-epidemic, these influences play a role in whether and how these preventative (or other) devices are used (22, 35). If this complexity is not recognized, there is a risk that PrEP and other biomedical devices place the main responsibility for HIV prevention on the individual alone and threatens (intentionally or not) blaming the individual if it fails. Thus, instead of predefining PrEP as a solution, and ask how we (i.e. the public health community) *get people to adhere*, this thesis has been concerned with how PrEP might work (or not work) for female sex workers, and how we can work together to make it a viable prevention choice. In the following discussion I will further reflect on the opportunities that a biomedical intervention as PrEP can offer considering our findings.

The high disengagement with PrEP services in our study could by some be interpreted as PrEP not being a viable prevention strategy among female sex workers in this context. However, notwithstanding the challenges that PrEP use had, the pill could also promote human flourishing and empowerment, which undeniably was important for several of the women in many domains of life (e.g.: health, work, social, financial). Looking at the quantitative findings in an alternate way, nearly 30% did attend the first follow-up appointment, which means that the pill worked for a substantial number of women, at least enough for them to return for a new appointment. Unpublished data from the mother study has also found that other women returned for follow-up at some point during the 12 months study, although late (this would be

defined as restarting). If PrEP is indeed considered *one of* the strategies in a combination prevention and comprehensive HIV prevention program for female sex workers, where several other viable options are also present, PrEP can prove to be a very important additional prevention choice. This holds even truer if some of the factors that seem to have impeded continued use, is dealt with.

Younger age was associated with early disengagement, resonating with findings from other studies (102, 132, 186, 196). Although age is situated at the individual level of the socio-ecological model, adolescent girls and young women are especially vulnerable in the HIV epidemic, which has been attributed to a range of factors, including social and structural ones, such as gender inequity, discrimination and poverty (1). Additionally, young people typically have less autonomy, are dependent on caregivers or others and might be more susceptible to peer pressure in the context of stigma (276). Factors such as these might contribute to more difficulties with following up PrEP regimens. In our study, we included women 18 years or older, and from my encounters with the women, I noted that there seemed to be a difference between how the older female sex workers carried themselves and how confident they seemed, compared to the younger women who I experienced as more timid and shy. Although it is important to acknowledge that PrEP is not a desired prevention for everyone, the findings point to need for prevention services for sex workers that specifically cater to younger sex worker's needs and ensure that they are comfortable when accessing PrEP (40). A recent study found that it could be very efficient to prioritize this group for preventive interventions (277). It is however important to acknowledge that it is unlikely that efforts conducted within the health sector alone will be enough, if other social drivers are not addressed (28).

Research on PrEP might also direct attention to specific health-related challenges affecting key populations or sub-groups within a key population that should receive more attention. PrEP roll-out has for instance been advocated as a gateway to mental health services (278). Mental distress was in our study experienced by 32.2% and was also associated with disengagement with PrEP services. Mental health can be regarded as a psycho-social factor, often measured on the individual level, but heavily linked to socio-structural factors, such as poverty, low education, stigma and inequality (279). A recent systematic review found high rates of mental health issues among female sex workers in LMICs, and that these are intertwined with other risk factors, such as violence, alcohol use, inconsistent condom use and HIV (58). As the health system through PrEP programming gets in touch with clients who might suffer from mental illness, PrEP can act as a gateway to mental health services if this is screened for and treatment

offered accordingly (278). There are however many unanswered questions related to how such an integration should be conducted, especially in low resource settings in LMICs (278). It would necessitate differentiating between individuals who need specialized services due to severe mental illness, versus those who might suffer from less severe mental illness or mental distress, where smaller scale interventions (cognitive behavioural therapy, motivational interviewing etc.) might be appropriate. It is also important to be mindful of the risks of medicalizing and individualizing social problems (which might explain the distress), or transporting "western notions" of mental illness without assessing its appropriateness in the given context, which has been at the centre of much debate within the field of "global mental health" (280).

Although early disengagement was high, many women were interested in starting PrEP as also found in other studies, illustrating that the first visit might be an opportunity to focus on other pressing social issues affecting groups with high prevalence of HIV, but which typically do not receive much attention. PrEP roll-out can thus be an opportunity to promote social change. By situating HIV prevention and PrEP use within a socio-ecological model and consulting literature, we in this study hypothesized that different factors could be important influences on PrEP usage and disengagement, and justified studying these. One of these factors were alcohol use, as there has been evidence pointing to alcohol use being a barrier for PrEP use (131, 195), while other studies have not been able corroborate this (110, 196). Alcohol use and its association with HIV (62, 237), and the high prevalence among female sex workers (57) also made it a highly relevant public health issue to investigate and integrate with HIV services. The lack of an association between harmful alcohol use and early disengagement with services in our study should be considered good news, as this might entail that the high consumption pattern among female sex workers does not interfere with the use of PrEP services in this context. The finding however should still has important public health implications. The documentation of the high prevalence of this practice, and the associated socio-structural factors (arrests, GBV and mobility) is a testimony of the "risk environment" that female sex workers live and can acquire HIV infections in. Rhodes (281) have defined a "risk environment" as a physical or social space, where many factors come together and interact to increase the possibility of harm. It is a framework that underscores the importance of context and has been used especially to understand drug-related harm (281). Focusing on context, shifts the (main) responsibility from individuals themselves, and focus more on the environment that shapes risks, while also pointing to context as an opportunity for change, and thus aligns well

with the socio-ecological model. Specifically in Tanzania, Leddy et al (64) have shown through qualitative and quantitative data analyses how the sex work environment can influence alcohol consumption among female sex workers, and how this in turn might increase HIV risk and gender-based violence (63, 64). They found that alcohol plays a role from the bar setting when getting in touch with clients, through the transitional/negotiation process where violence can erupt if the women refuse sex after being bought alcohol or make it difficult to negotiate condom use (64). Finally, women themselves can be so intoxicated that they are at risk for unprotected and/or unwanted sex (64). Indeed, there were also accounts of women being taken advantage of in a drunken state in our study. The risk environment was clearly evident from the women's stories in relation to other aspects than alcohol use. Women narrated difficult condom negotiations, financial strain and thus the need to accept sexual risk, and also violence and coercion from partners and clients, in line with previous research in Tanzania (6, 64, 179) and reviews on sex work and structural risks (4, 44, 50). Women also referred to being in risky situations when describing why they needed PrEP. Thus, PrEP was an intervention that could circumvent the risk environment (without sufficiently altering it).

With biomedical innovations such as PrEP, financial resources for research and implementation follows. Notwithstanding the risk of distorting attention and resources away from more "messy" social problems for which there is not one simple solution, it can also provide an opportunity to advocate for renewed focus on social change. This study has for instance been able to highlight aspects of structural violence through the conversations with women and through the deliberate integration of questions in the quantitative interviews that could acquire information about social and structural risk factors. We for instance found that Incarceration/arrest and GBV was associated with harmful alcohol use, and we have highlighted how structural violence conditions such as stigma affected PrEP perceptions and usage. Both criminalization and stigma (282) are examples of structural violence in practice. They are structural conditions, because they belong to the political organization of our social world, and they are violent because they inflict harm. Altering these conditions, could in addition to alleviate suffering directly, pave the way for more trust in health services. A systematic review investigating the relationships between punitive laws, sex work stigma and HIV, have for instance found that in criminalized settings, HIV is associated with fear of seeking health services, compared to non-criminalized setting. The review included evidence from over 7000 female sex workers in 10 Sub-Saharan countries and could also show that increasingly punitive laws are associated with HIV, and that the presence of both stigma and

unfavourable legislation increases this risk even more (29). Tackling structural violence is thus an imperative in a comprehensive HIV prevention approach.

9.0 Conclusions and Recommendations

This study found that early disengagement with PrEP services among female sex workers in Dar es Salaam was high, and associated with younger age, having fewer sex work clients and mental distress. We explored PrEP perceptions and experiences and found that PrEP had multiple and diverse effects in their minds, bodies and lives, which we referred to as the effectosphere of PrEP. This ranged from leading to a sense of empowerment and human flourishing, to disclosure of sensitive information and stigma processes, to medicalization and difficulties with following through on prescribed regimens, underlying the complexity of a pill for prevention. We also found that the women had a high burden of harmful alcohol use which was associated with gender-based violence, criminalization and the mobility for sex work.

The study has provided some of the first qualitative and quantitative evidence of PrEP use among female sex workers in the country, and this was also the first time harmful alcohol use was estimated among this group in this context, and addressed using a socio-ecological approach. In addition to support previous findings among female sex workers from other contexts, the study have further displayed that PrEP can be seen as a way to protect others, something reminding the user that one is seen and cared for, but also that it can make someone question one's own HIV status. These are self-perceived effects not we have not seen described elsewhere. Although medical mistrust has been evoked with regards to the use of ART and PrEP earlier, our study add evidence on the connection between PrEP, medical mistrust and the stigmatized nature of sex work. The quantitative findings on factors associated with disengagement from PrEP services also provides much needed knowledge which can be used to improve services, indicating that integration of mental health services and an increased focus on young sex workers should be a priority . Additionally, understanding better why having fewer clients predicted disengagement with services, will be important for future research, and to assess if this in fact in alignment with a "prevention-effective adherence paradigm" with fluctuating risk (106, 122). Although alcohol use was not associated with disengagement with the PrEP service, we suggest in line with other scholars (278) that PrEP programs could be a gateway to other health services when considering the high burden of alcohol use among this

population, as well as addressing other socio-structural vulnerabilities of female sex worker's lives.

The insights provided by using mixed methods would not have been possible to arrive at if only employing qualitative or quantitative methods, such as understanding that mobility could contribute to disengagement with PrEP services for some individuals, however, not on a statistical significant level. Furthermore, if we had only collected quantitative data on disengagement, we might have missed that PrEP was empowering and promoted human flourishing as well as bringing with it some challenges. This might have provided a one-dimensional picture of what we found was a prevention tool with many effects. Furthermore, few participants brought up criminalization and arrest in the qualitative interviews, but through the survey we established that this was quite common, and for instance associated with harmful alcohol use. As such, the qualitative and the quantitative component gave insights into different aspects of the female sex workers' PrEP use and the context of their lives, and they made visible strands of knowledge that would otherwise have been missed. Another strength with this design is that findings could be corroborated, as we triangulated quantitative and qualitative data; for instance did the qualitative interviews reveal that drinking alcohol was a part of work-life, that the women were working hard to provide for their families, and that PrEP use could be a challenge, which we had also found through the quantitative component of the study.

So how does the future of HIV prevention look for female sex workers? There are now new long-acting PrEP that might mitigate some of the challenges encountered such as daily pill taking, with potentially less exposure of information and stigma related to PrEP use. Challenges with affordability might come into play as these are newer inventions. However there are hopes of more affordable pricing as a licensing deal was made in 2022 which allows a number of countries to purchase them as lower rates (1). Nevertheless, even in the advent of new biomedical tools and administrative routes, it seems evident that HIV prevention needs to be acknowledged as a complex practice, with pharmacological elements and modality (pill, injectable, implant), not alone being able to determine how it will be used and how its effects in the world will be. An injectable also requires clinical follow-up with the consequences this might have, it can give side-effects, as will even newer biomedical tools that might enter the market in the future. These will also need to engage with the social lives of users to be effective.

With this thesis the aspiration has been to contribute to HIV prevention research field with a focus on female sex workers, by providing evidence on factors associated with disengagement,

how PrEP acts in their life, and shed light on social circumstances associated with HIV and PrEP for this group. The findings support the need for integrated approaches that include individual, social and structural levels of the socio-ecological model to achieve more equitable health outcomes within the HIV epidemic, and hopefully strive towards not only lives without HIV, but lives with human flourishing. Tanzania has achieved great success in expanding treatment, and prevention for HIV with lowering prevalence and incidence rates. There is however untapped potential when it comes to altering social and structural circumstances for key populations groups and ensure more equitable outcomes. PrEP programming might be this opportunity and should be seized.

References

1. Joint United Nations Programme on HIV/AIDS (UNAIDS). The Path That Ends Aids. UNAIDS; 2023.
2. Joint United Nations Programme on HIV/AIDS (UNAIDS). Global HIV & Aids statistics - 2022 fact sheet. UNAIDS; 2022.
3. World Health Organization (WHO). Guideline on when to start antiretroviral therapy and on pre-exposure prophylaxis for HIV. Geneva: WHO; 2015. Report No.: 9241509562.
4. Shannon K, Goldenberg SM, Deering KN, Strathdee SA. HIV infection among female sex workers in concentrated and high prevalence epidemics: why a structural determinants framework is needed. Curr Opin HIV AIDS. 2014;9(2):174-82.
5. Dutta A, Barker C, Makyao N. Consensus estimates on key population size and HIV prevalence in Tanzania: National AIDS Control Programme (NACP), Ministry of Health and Social Welfare. Dar es Salaam, Tanzania; 2014.
6. Mmbaga EJ, Makayo N, Leshabari MT, Leyna GH, Karonda P, Ndayongeje J, et al. Integrated bio-behavioural survey among female sex workers in Dar Es Salaam, 2017: National Aids Control Programme, Minstry of Health, Community Developement, Gender, Elders and Children. Dar es Salaam, Tanzania.; 2018. 72 p.
7. Tanzania Commission for AIDS, Zanzibar AIDS Commission. Tanzania HIV Impact Survey (THIS) 2022-2023: Summary Sheet. Dar es Salaam, Tanzania: TACAIDS, ZAC; 2023.
8. Ministry of Health, Community, Development, Gender Elderly and Children, National National AIDS Control Programme. National Guidelines for Management of HIV and AIDS. MoHCDEC, NACP; 2019.
9. Ministry of Health, Community, Development, Gender Elderly and Children, (NACP) NACP. Health Sector HIV and AIDS Strategic Plan IV (2017-2022). Dar es Salaam: MoHCDEC, NACP; 2017. p. 63.
10. Desa U. Transforming our world: The 2030 agenda for sustainable development. 2016.
11. Joint United Nations Programme on HIV/AIDS (UNAIDS. End Inequalities. End Aids. Global Aids Strategy 2021–2026. UNAIDS Geneva; 2021.
12. Iliffe J. Views from Below. The African Aids Epidemic: A History. Cambridge: Boydell & Brewer; 2006. p. 80-97.
13. Slagstad K. Det ligger i blodet Oslo: Forlaget Press; 2023. 523 p.
14. Mbonu NC, van den Borne B, De Vries NK. Stigma of People with HIV/AIDS in Sub-Saharan Africa: A Literature Review. J Trop Med. 2009;2009:145891.
15. National Institute of Allergy and Infectious Diseases, USA. Antiretroviral Drug Discovery and Development 2018 [Available from: https://www.niaid.nih.gov/diseases-conditions/antiretroviral-drug-development.
16. Messac L, Prabhu K. 5. Redefining the Possible: The Global AIDS Response. In: Paul F, Arthur K, Jim K, Matthew B, editors. Reimagining Global Health. Berkeley: University of California Press; 2013. p. 111-32.
17. Nguyen VK, Ako CY, Niamba P, Sylla A, Tiendrébéogo I. Adherence as therapeutic citizenship: impact of the history of access to antiretroviral drugs on adherence to treatment. AIDS (London, England). 2007;21 Suppl 5:S31-5.
18. Sidley P. Drug companies withdraw law suit against South Africa. BMJ. 2001;322(7293):1011.
19. Joint United Nations Programme on HIV/Aids (UNAIDS). 40 Years of the AIDS response, fact sheet. UNAIDS; 2021.
20. World Health Organization (WHO). Millenium Developement Goals (MDG) - Progress Report. 2018.
21. Benton A. HIV exceptionalism : development through disease in Sierra Leone. Minneapolis, Minnesota and London, England: University of Minnesota Press; 2015.

22. Kippax S, Stephenson N, Parker RG, Aggleton P. Between individual agency and structure in HIV prevention: understanding the middle ground of social practice. Am J Public Health. 2013;103(8):1367-75.
23. Parker R. Grassroots Activism, Civil Society Mobilization, and the Politics of the Global HIV/AIDS Epidemic. The Brown Journal of World Affairs. 2011;17(2):21-37.
24. Reza-Paul S, Beattie T, Syed HU, Venukumar KT, Venugopal MS, Fathima MP, et al. Declines in risk behaviour and sexually transmitted infection prevalence following a community-led HIV preventive intervention among female sex workers in Mysore, India. AIDS (London, England). 2008;22 Suppl 5:S91-100.
25. United Nations (UN). The Sustainable Developement Goals - fact sheet. Time for Global Action for People and Planet2015.
26. Assefa Y, Gilks CF. Ending the epidemic of HIV/AIDS by 2030: Will there be an endgame to HIV, or an endemic HIV requiring an integrated health systems response in many countries? International Journal of Infectious Diseases. 2020;100:273-7.
27. Birungi C, Azcona JA, Munevar D. A pandemic triad: HIV, COVID-19 and debt in low-and middle-income countries. African Journal of AIDS Research. 2022;21(2):110-22.
28. Joint United Nations Programme on HIV/AIDS (UNAIDS). Dangerous Inequalities - World Aids Day Report. UNAIDS; 2022.
29. Lyons CE, Schwartz SR, Murray SM, Shannon K, Diouf D, Mothopeng T, et al. The role of sex work laws and stigmas in increasing HIV risks among sex workers. Nature Communications. 2020;11(1):773.
30. Mishra S, Boily M-C, Schwartz S, Beyrer C, Blanchard JF, Moses S, et al. Data and methods to characterize the role of sex work and to inform sex work programs in generalized HIV epidemics: evidence to challenge assumptions. Ann Epidemiol. 2016;26(8):557-69.
31. Lyons CE, Twahirwa Rwema JO, Makofane K, Diouf D, Mfochive Njindam I, Ba I, et al. Associations between punitive policies and legal barriers to consensual same-sex sexual acts and HIV among gay men and other men who have sex with men in sub-Saharan Africa: a multicountry, respondent-driven sampling survey. Lancet HIV. 2023;10(3):e186-e94.
32. Platt L, Grenfell P, Meiksin R, Elmes J, Sherman SG, Sanders T, et al. Associations between sex work laws and sex workers' health: A systematic review and meta-analysis of quantitative and qualitative studies. PLoS Med. 2018;15(12):e1002680.
33. Maturo A. Medicalization: current concept and future directions in a bionic society. Mens Sana Monogr. 2012;10(1):122-33.
34. Parkhurst JO. Structural approaches for prevention of sexually transmitted HIV in general populations: definitions and an operational approach. J Int AIDS Soc. 2014;17(1):19052.
35. Auerbach JD, Parkhurst JO, Cáceres CF. Addressing social drivers of HIV/AIDS for the long-term response: conceptual and methodological considerations. Global public health. 2011;6 Suppl 3:S293-309.
36. Kippax S. Effective HIV prevention: the indispensable role of social science. J Int AIDS Soc. 2012;15(2):17357-.
37. Gupta GR, Parkhurst JO, Ogden JA, Aggleton P, Mahal A. Structural approaches to HIV prevention. Lancet (London, England). 2008;372(9640):764-75.
38. Loncar D, Izazola-Licea JA, Krishnakumar J. Exploring relationships between HIV programme outcomes and the societal enabling environment: A structural equation modeling statistical analysis in 138 low- and middle-income countries. PLOS Glob Public Health. 2023;3(5):e0001864.
39. Byanyima W, Kavanagh MM. Equalizing the response to AIDS and other pandemics. PLOS Glob Public Health. 2022;2(12):e0001370.
40. World Health Organization (WHO). HIV and young people who sell sex: a technical briefing. Geneva: WHO; 2015.
41. Boonzaier F. Researching sex work: Doing decolonial, intersectional narrative analysis. The Emerald handbook of narrative criminology: Emerald Publishing Limited; 2019. p. 467-91.

42. Stengaard AR, Combs L, Supervie V, Croxford S, Desai S, Sullivan AK, et al. HIV seroprevalence in five key populations in Europe: a systematic literature review, 2009 to 2019. Euro Surveill. 2021;26(47).
43. World Health Organization. Differentiated and simplified pre-exposure prophylaxis for HIV prevention: update to WHO implementation guidance: technical brief. 2022.
44. Shannon K, Crago AL, Baral SD, Bekker LG, Kerrigan D, Decker MR, et al. The global response and unmet actions for HIV and sex workers. Lancet (London, England). 2018;392(10148):698-710.
45. Ringdal NJ. Verdens vanskeligste yrke : de prostituertes verdenshistorie. Oslo: Cappelen; 1997.
46. Weitzer R. Sociology of Sex Work. Annu Rev Sociol. 2009;35:213-34.
47. De Walque D, Dow W, Gong E. Coping with risk: the effects of shocks on reproductive health and transactional sex in rural Tanzania. World Bank Policy Research Working Paper. 2014(6751).
48. Mgbako CA. To live freely in this world. To Live Freely in This World: New York University Press; 2016.
49. Yingwana N. "We Fit in the Society by Force": Sex Work and Feminism in Africa. Meridians. 2018;17(2):279-95.
50. Shannon K, Strathdee SA, Goldenberg SM, Duff P, Mwangi P, Rusakova M, et al. Global epidemiology of HIV among female sex workers: influence of structural determinants. Lancet (London, England). 2015;385(9962):55-71.
51. Johnson L, Potter LC, Beeching H, Bradbury M, Matos B, Sumner G, et al. Interventions to improve health and the determinants of health among sex workers in high-income countries: a systematic review. Lancet Public Health. 2023;8(2):e141-e54.
52. Azhar S, Dasgupta S, Sinha S, Karandikar S. Diversity in Sex Work in India: Challenging Stereotypes Regarding Sex Workers. Sex Cult. 2020;24(6):1774-97.
53. Mellor A, Benoit C. Understanding the Diversity of People in Sex Work: Views from Leaders in Sex Worker Organizations. Social Sciences. 2023;12(3).
54. Li Q, Li X, Stanton B. Alcohol use among female sex workers and male clients: an integrative review of global literature. Alcohol Alcohol. 2010;45(2):188-99.
55. Lancaster KE, Hetrick A, Jaquet A, Adedimeji A, Atwoli L, Colby DJ, et al. Substance use and universal access to HIV testing and treatment in sub-Saharan Africa: implications and research priorities. J Virus Erad. 2018;4(Suppl 2):26-32.
56. Kuteesa MO, Seeley J, Weiss HA, Cook S, Kamali A, Webb EL. Alcohol Misuse and Illicit Drug Use Among Occupational Groups at High Risk of HIV in Sub-Saharan Africa: A Systematic Review. AIDS Behav. 2019;23(12):3199-225.
57. Beksinska A, Karlsen O, Gafos M, Beattie TS. Alcohol use and associated risk factors among female sex workers in low- and middle-income countries: A systematic review and meta-analysis. PLOS Glob Public Health. 2023;3(6):e0001216.
58. Beattie TS, Smilenova B, Krishnaratne S, Mazzuca A. Mental health problems among female sex workers in low- and middle-income countries: A systematic review and meta-analysis. PLoS Med. 2020;17(9):e1003297.
59. Kerrigan D, Barrington C. HIV and mental health services for female sex workers. Lancet HIV. 2022;9(8):e528-e9.
60. World Health Organization (WHO). Global status report on alcohol and health 2018. 2018 27.09. Report No.: 9241565632.
61. Lancaster KE, Cernigliaro D, Zulliger R, Fleming PF. HIV care and treatment experiences among female sex workers living with HIV in sub-Saharan Africa: A systematic review. Afr J AIDS Res. 2016;15(4):377-86.
62. Chersich MF, Bosire W, King'ola N, Temmerman M, Luchters S. Effects of hazardous and harmful alcohol use on HIV incidence and sexual behaviour: a cohort study of Kenyan female sex workers. Global Health. 2014;10(1):22.

63. Leddy AM, Underwood C, Decker MR, Mbwambo J, Likindikoki S, Galai N, et al. Adapting the Risk Environment Framework to Understand Substance Use, Gender-Based Violence, and HIV Risk Behaviors Among Female Sex Workers in Tanzania. AIDS and behav. 2018;22(10):3296-306.
64. Leddy AM, Kerrigan D, Kennedy CE, Mbwambo J, Likindikoki S, Underwood CR. 'You already drank my beer, I can decide anything': using structuration theory to explore the dynamics of alcohol use, gender-based violence and HIV risk among female sex workers in Tanzania. Cult Health Sex. 2018;20(12):1409-23.
65. Kerrigan D, Mbwambo J, Likindikoki S, Davis W, Mantsios A, Beckham S, et al. Let's Stick Together: Community empowerment approach significantly impacts multiple HIV and sexual and reproductive health outcomes among female sex workers in Tanzania. J Int AIDS Soc 22nd International AIDS Conference. 2018;21(Supplement 6).
66. Bekker L-G, Johnson L, Cowan F, Overs C, Besada D, Hillier S, et al. Combination HIV prevention for female sex workers: what is the evidence? Lancet (London, England). 2015;385(9962):72-87.
67. Kerrigan D, Kennedy CE, Morgan-Thomas R, Reza-Paul S, Mwangi P, Win KT, et al. A community empowerment approach to the HIV response among sex workers: effectiveness, challenges, and considerations for implementation and scale-up. Lancet (London, England). 2015;385(9963):172-85.
68. Wilson D. HIV Programs for Sex Workers: Lessons and Challenges for Developing and Delivering Programs. PLoS Med. 2015;12(6):e1001808.
69. Bernays S, Bourne A, Kippax S, Aggleton P, Parker R. Remaking HIV prevention: The promise of TasP, U= U and PrEP. 2021. In: Remaking HIV prevention in the 21st century: The promise of TasP, U= U and PrEP [Internet]. [1-18]. Available from: https://doi.org/10.1007/978-3-030-69819-5.
70. Rosengarten M. An unfinished history: a story of ongoing events and mutating HIV problems. 2021. In: Remaking HIV Prevention in the 21st Century: The Promise of TasP, U= U and PrEP [Internet]. [289-302].
71. World Health Organization (WHO) JUNPoHAU. Creating effective partnerships for HIV prevention trials: report of a UNAIDS Consultation, Geneva 20–21 June 2005. AIDS (London, England). 2006;20(6).
72. Fonner VA, Dalglish SL, Kennedy CE, Baggaley R, O'Reilly KR, Koechlin FM, et al. Effectiveness and safety of oral HIV preexposure prophylaxis for all populations. AIDS (London, England). 2016;30(12):1973-83.
73. Cáceres CF, Koechlin F, Goicochea P, Sow P-S, O'Reilly KR, Mayer KH, et al. The promises and challenges of pre-exposure prophylaxis as part of the emerging paradigm of combination HIV prevention. J Int AIDS Soc. 2015;18(4 Suppl 3):19949-.
74. Fonner VA, Kennedy CE, O'Reilly KR, Sweat MD. Systematic assessment of condom use measurement in evaluation of HIV prevention interventions: need for standardization of measures. AIDS behav. 2014;18(12):2374-86.
75. Anderson PL, Glidden DV, Liu A, Buchbinder S, Lama JR, Guanira JV, et al. Emtricitabine-tenofovir concentrations and pre-exposure prophylaxis efficacy in men who have sex with men. Sci Transl Med. 2012;4(151):151ra25-ra25.
76. Van Damme L, Corneli A, Ahmed K, Agot K, Lombaard J, Kapiga S, et al. Preexposure Prophylaxis for HIV Infection among African Women. N Engl J Med. 2012;367(5):411-22.
77. Marrazzo JM, Ramjee G, Richardson BA, Gomez K, Mgodi N, Nair G, et al. Tenofovir-based preexposure prophylaxis for HIV infection among African women. N Engl J Med. 2015;372(6):509-18.
78. Donnell D, Baeten JM, Bumpus NN, Brantley J, Bangsberg DR, Haberer JE, et al. HIV protective efficacy and correlates of tenofovir blood concentrations in a clinical trial of PrEP for HIV prevention. J Acquir Immune Defic Syndr. 2014;66(3):340-8.
79. Hanscom B, Janes HE, Guarino PD, Huang Y, Brown ER, Chen YQ, et al. Brief Report: Preventing HIV-1 Infection in Women Using Oral Preexposure Prophylaxis: A Meta-analysis of Current Evidence. J Acquir Immune Defic Syndr. 2016;73(5):606-8.

80. Anderson PL, Marzinke MA, Glidden DV. Updating the Adherence–Response for Oral Emtricitabine/Tenofovir Disoproxil Fumarate for Human Immunodeficiency Virus Pre-Exposure Prophylaxis Among Cisgender Women. Clin Infect Dis. 2023;76(10):1850-3.
81. Marrazzo J, Becker M, Bekker LG, Celum CL, Kiragu M, Leech A, et al. 8 + Years Pooled Analysis: Adherence and HIV incidence in 6000 women on F/TDF for PrEP. Conference on Retroviruses and Opportunistic Infections (CROI),; February 19-22, 2023; Seattle, Washington2023.
82. van der Straten A, Stadler J, Montgomery E, Hartmann M, Magazi B, Mathebula F, et al. Women's experiences with oral and vaginal pre-exposure prophylaxis: the VOICE-C qualitative study in Johannesburg, South Africa. PloS one. 2014;9(2):e89118.
83. Moore M, Stansfield S, Donnell DJ, Boily MC, Mitchell KM, Anderson PL, et al. Efficacy estimates of oral pre-exposure prophylaxis for HIV prevention in cisgender women with partial adherence. Nat Med. 2023;29(11):2748-52.
84. Patterson KB, Prince HA, Kraft E, Jenkins AJ, Shaheen NJ, Rooney JF, et al. Penetration of Tenofovir and Emtricitabine in Mucosal Tissues: Implications for Prevention of HIV-1 Transmission. Sci Transl Med. 2011;3(112):112re4-re4.
85. World Health Organization. Technical brief: what's the 2+ 1+ 1? Event-driven oral pre-exposure prophylaxis to prevent HIV for men who have sex with men: update to WHO's recommendation on oral PrEP. World Health Organization; 2019.
86. World Health Organization (WHO). HIV drug resistance - Fact sheet. 2022.
87. Ortblad KF, Stalter RM, Bukusi EA, Ngure K, Mujugura A, Celum C, et al. No Evidence of Sexual Risk Compensation Following PrEP Initiation Among Heterosexual HIV Serodiscordant Couples in Kenya and Uganda. AIDS Behav. 2020;24(5):1365-75.
88. Quaife M, MacGregor L, Ong JJ, Gafos M, Torres-Rueda S, Grant H, et al. Risk compensation and STI incidence in PrEP programmes. Lancet HIV. 2020;7(4):e222-e3.
89. Giguère K, Béhanzin L, Guédou FA, Talbot D, Leblond FA, Goma-Matsétsé E, et al. PrEP Use Among Female Sex Workers: No Evidence for Risk Compensation. J Acquir Immune Defic Syndr. 2019;82(3):257-64.
90. Rojas Castro D, Delabre RM, Molina JM. Give PrEP a chance: moving on from the "risk compensation" concept. J Int AIDS Soc. 2019;22 Suppl 6(Suppl Suppl 6):e25351.
91. The global PrEP tracker, Q3 2023 [Internet]. 2023 [cited 31.12.23]. Available from: https://data.prepwatch.org/.
92. Fonner VA, Ridgeway K, van der Straten A, Lorenzetti L, Dinh N, Rodolph M, et al. Safety and efficacy of long-acting injectable cabotegravir as preexposure prophylaxis to prevent HIV acquisition. AIDS (London, England). 2023;37(6):957-66.
93. World Health Organization (WHO). Guidelines on long-acting injectable cabotegravir for HIV prevention. WHO; 2022. Report No.: 924005409X.
94. Baeten JM, Palanee-Phillips T, Mgodi NM, Mayo AJ, Szydlo DW, Ramjee G, et al. Safety, uptake, and use of a dapivirine vaginal ring for HIV-1 prevention in African women (HOPE): an open-label, extension study. Lancet HIV. 2021;8(2):e87-e95.
95. Karim SSA, Baxter C. HIV pre-exposure prophylaxis implementation in Africa: some early lessons. Lancet Glob Health. 2021;9(12):e1634-e5.
96. Nunn AS, Brinkley-Rubinstein L, Oldenburg CE, Mayer KH, Mimiaga M, Patel R, et al. Defining the HIV pre-exposure prophylaxis care continuum. AIDS (London, England). 2017;31(5):731-4.
97. World Health Organization (WHO). WHO implementation tool for pre-exposure prophylaxis (PrEP) of HIV infection: module 5: monitoring and evaluation. Geneva; 2018.
98. Mboup A, Béhanzin L, Guédou F, Giguère K, Geraldo N, Zannou DM, et al. Comparison of adherence measurement tools used in a pre-exposure prophylaxis demonstration study among female sex workers in Benin. Medicine. 2020;99(21).
99. Stankevitz K, Grant H, Lloyd J, Gomez GB, Kripke K, Torjesen K, et al. Oral preexposure prophylaxis continuation, measurement and reporting. AIDS (London, England). 2020;34(12):1801-11.

100. Rutstein SE, Smith DK, Dalal S, Baggaley RC, Cohen MS. Initiation, discontinuation, and restarting HIV pre-exposure prophylaxis: ongoing implementation strategies. Lancet HIV. 2020;7(10):e721-e30.
101. Zhang J, Li C, Xu J, Hu Z, Rutstein SE, Tucker JD, et al. Discontinuation, suboptimal adherence, and reinitiation of oral HIV pre-exposure prophylaxis: a global systematic review and meta-analysis. Lancet HIV. 2022;9(4):e254-e68.
102. Sarr M, Gueye D, Mboup A, Diouf O, Bao MDB, Ndiaye AJ, et al. Uptake, retention, and outcomes in a demonstration project of pre-exposure prophylaxis among female sex workers in public health centers in Senegal. Int J STD AIDS. 2020;31(11):1063-72.
103. Koss CA, Charlebois ED, Ayieko J, Kwarisiima D, Kabami J, Balzer LB, et al. Uptake, engagement, and adherence to pre-exposure prophylaxis offered after population HIV testing in rural Kenya and Uganda: 72-week interim analysis of observational data from the SEARCH study. Lancet HIV. 2020.
104. Grinsztejn B, Hoagland B, Moreira RI, Kallas EG, Madruga JV, Goulart S, et al. Retention, engagement, and adherence to pre-exposure prophylaxis for men who have sex with men and transgender women in PrEP Brasil: 48 week results of a demonstration study. Lancet HIV. 2018;5(3):e136-e45.
105. Leddy AM, Weiss E, Yam E, Pulerwitz J. Gender-based violence and engagement in biomedical HIV prevention, care and treatment: a scoping review. BMC Public Health. 2019;19(1):897.
106. Haberer JE, Bangsberg DR, Baeten JM, Curran K, Koechlin F, Amico KR, et al. Defining success with HIV pre-exposure prophylaxis: a prevention-effective adherence paradigm. AIDS (London, England). 2015;29(11).
107. Grov C, Westmoreland DA, D'Angelo AB, Pantalone DW. How Has HIV Pre-Exposure Prophylaxis (PrEP) Changed Sex? A Review of Research in a New Era of Bio-behavioral HIV Prevention. J Sex Res. 2021;58(7):891-913.
108. Glick JL, Russo R, Jivapong B, Rosman L, Pelaez D, Footer KHA, et al. The PrEP Care Continuum Among Cisgender Women Who Sell Sex and/or Use Drugs Globally: A Systematic Review. AIDS Behav. 2019.
109. Beckham SW, Mantsios A, Galai N, Likindikoki S, Mbwambo J, Davis W, et al. Acceptability of multiple modalities of pre-exposure prophylaxis (PrEP) among female sex workers in Tanzania: a mixed-methods study. BMJ open. 2022;12(8):e058611.
110. Witte SS, Filippone P, Ssewamala FM, Nabunya P, Bahar OS, Mayo-Wilson LJ, et al. PrEP acceptability and initiation among women engaged in sex work in Uganda: Implications for HIV prevention. eClinicalMedicine. 2022;44.
111. Peng P, Su S, Fairley CK, Chu M, Jiang S, Zhuang X, et al. A Global Estimate of the Acceptability of Pre-exposure Prophylaxis for HIV Among Men Who have Sex with Men: A Systematic Review and Meta-analysis. AIDS Behav. 2018;22(4):1063-74.
112. Ortblad KF, Chanda MM, Musoke DK, Ngabirano T, Mwale M, Nakitende A, et al. Acceptability of HIV self-testing to support pre-exposure prophylaxis among female sex workers in Uganda and Zambia: results from two randomized controlled trials. BMC Infect Dis. 2018;18(1):503.
113. Lancaster KE, Lungu T, Bula A, Shea JM, Shoben A, Hosseinipour MC, et al. Preferences for Pre-exposure Prophylaxis Service Delivery Among Female Sex Workers in Malawi: A Discrete Choice Experiment. AIDS Behav. 2020;24(5):1294-303.
114. Sidebottom D, Ekström AM, Strömdahl S. A systematic review of adherence to oral pre-exposure prophylaxis for HIV - how can we improve uptake and adherence? BMC Infect Dis. 2018;18(1):581.
115. Nakiganda LJ, Grulich AE, Poynten IM, Serwadda D, Bazaale JM, Jin J, et al. Self-reported and pill count measures of adherence to oral HIV PrEP among female sex workers living in South-Western Uganda. PloS one. 2022;17(11):e0277226.
116. Irungu EM, Mugwanya KK, Mugo NR, Bukusi EA, Donnell D, Odoyo J, et al. Integration of pre-exposure prophylaxis services into public HIV care clinics in Kenya: a pragmatic stepped-wedge randomised trial. Lancet Glob Health. 2021;9(12):e1730-e9.

117. Celum CL, Bukusi EA, Bekker LG, Delany-Moretlwe S, Kidoguchi L, Omollo V, et al. PrEP use and HIV seroconversion rates in adolescent girls and young women from Kenya and South Africa: the POWER demonstration project. J Int AIDS Soc. 2022;25(7):e25962.
118. Mboup A, Béhanzin L, Guédou FA, Geraldo N, Goma-Matsétsé E, Giguère K, et al. Early antiretroviral therapy and daily pre-exposure prophylaxis for HIV prevention among female sex workers in Cotonou, Benin: a prospective observational demonstration study. J Int AIDS Soc. 2018;21(11):e25208.
119. Eakle R, Gomez GB, Naicker N, Bothma R, Mbogua J, Cabrera Escobar MA, et al. HIV pre-exposure prophylaxis and early antiretroviral treatment among female sex workers in South Africa: Results from a prospective observational demonstration project. PLoS Med. 2017;14(11):e1002444.
120. Kyongo J, Kiragu M, Karuga R, Ochieng C, Ngunjiri A, Wachihi C, et al., editors. How long will they take it? Oral pre-exposure prophylaxis (PrEP) retention for female sex workers, men who have sex with men and young women in a demonstration project in Kenya. J Int AIDS Soc; 2018.
121. Cowan FM, Davey C, Fearon E, Mushati P, Dirawo J, Chabata S, et al. Targeted combination prevention to support female sex workers in Zimbabwe accessing and adhering to antiretrovirals for treatment and prevention of HIV (SAPPH-IRe): a cluster-randomised trial. Lancet HIV. 2018;5(8):e417-e26.
122. Haberer JE, Mujugira A, Mayer KH. The future of HIV pre-exposure prophylaxis adherence: reducing barriers and increasing opportunities. Lancet HIV. 2023;10(6):e404-e11.
123. Ghayda RA, Hong SH, Yang JW, Jeong GH, Lee KH, Kronbichler A, et al. A Review of Pre-Exposure Prophylaxis Adherence among Female Sex Workers. Yonsei Med J. 2020;61(5):349-58.
124. Makhakhe NF, Sliep Y, Meyer-Weitz A. "Whatever is in the ARVs, is Also in the PrEP" Challenges Associated With Oral Pre-exposure Prophylaxis Use Among Female Sex Workers in South Africa. Front Public Health. 2022;10.
125. Sahay S, Verma A, Shewale S, Bangar S, Bijeshkumar A, Angolkar M, et al. Understanding issues around use of oral pre exposure prophylaxis among female sex workers in India. BMC Infect Dis. 2021;21(1):930.
126. Amogne MD, Sanders EJ, Belihu WB, Sundewall J, Agardh A. Condom failure and pre-exposure prophylaxis use experience among female sex workers in Ethiopia: a qualitative study. BMC Public Health. 2022;22(1):1079.
127. Jaiswal J, Halkitis PN. Towards a More Inclusive and Dynamic Understanding of Medical Mistrust Informed by Science. Behav Med. 2019;45(2):79-85.
128. Nhamo D, Duma SE, Ojewole EB, Chibanda D, Cowan FM. Factors motivating female sex workers to initiate pre- exposure prophylaxis for HIV prevention in Zimbabwe. PloS one. 2022;17(7):e0264470.
129. Makhakhe NF, Weitz AM, Sliep Y. Motivating factors associated with oral pre-exposure prophylaxis use among female sex workers in South Africa. J Health Psychol 2022;27(12):2820-33.
130. Mujugira A, Nakyanzi A, Kasiita V, Kamusiime B, Nalukwago GK, Nalumansi A, et al. HIV self-testing and oral pre-exposure prophylaxis are empowering for sex workers and their intimate partners: a qualitative study in Uganda. J Int AIDS Soc. 2021;24(9):e25782.
131. Atukunda EC, Owembabazi M, Pratt MC, Psaros C, Muyindike W, Chitneni P, et al. A qualitative exploration to understand barriers and facilitators to daily oral PrEP uptake and sustained adherence among HIV-negative women planning for or with pregnancy in rural Southwestern Uganda. J Int AIDS Soc. 2022;25(3):e25894.
132. Celum CL, Delany-Moretlwe S, Baeten JM, van der Straten A, Hosek S, Bukusi EA, et al. HIV pre-exposure prophylaxis for adolescent girls and young women in Africa: from efficacy trials to delivery. J Int AIDS Soc. 2019;22 Suppl 4:e25298.
133. Mantsios A, Muraleetharan O, Donastorg Y, Perez M, Gomez H, Shembilu C, et al. "She is the one who knows": A qualitative exploration of oral and injectable PrEP as part of a community empowerment approach to HIV prevention among female sex workers in the Dominican Republic and Tanzania. PLOS Glob Public Health. 2022;2(9):e0000981.

134. Pyra MN, Haberer JE, Hasen N, Reed J, Mugo NR, Baeten JM. Global implementation of PrEP for HIV prevention: setting expectations for impact. J Int AIDS Soc. 2019;22(8):e25370-e.
135. Cowan FM, Delany-Moretlwe S. Promise and pitfalls of pre-exposure prophylaxis for female sex workers. Curr Opin HIV AIDS. 2016;11(1):27-34.
136. Cowan FM, Reza-Paul S, Ramaiah M, Kerrigan DL. Strategies to promote the meaningful involvement of sex workers in HIV prevention and care. Curr Opin HIV AIDS. 2019;14(5):401-8.
137. O'Malley G, Barnabee G, Mugwanya K. Scaling-up PrEP Delivery in Sub-Saharan Africa: What Can We Learn from the Scale-up of ART? Curr HIV/AIDS Rep. 2019;16(2):141-50.
138. O'Malley TL, Hawk ME, Egan JE, Krier SE, Burke JG. Intimate Partner Violence and Pre-exposure Prophylaxis (PrEP): A Rapid Review of Current Evidence for Women's HIV Prevention. AIDS Behav. 2019.
139. Tanzania National Bureau of Statistics. 2022 Population and Housing Census 2022.
140. Milla Nyyssola TK, Tim Ndezi. Dar es Salaam - City Scoping Study. African Researc Consortium,; 2021.
141. Ministry of Health, Community, Development, Gender Elderly and Children. Health Sector Strategic Plan Tanzania 2021-2026 - Leaving No One Behind. 2021.
142. Leyna GH, Berkman LF, Njelekela MA, Kazonda P, Irema K, Fawzi W, et al. Profile: The Dar Es Salaam Health and Demographic Surveillance System (Dar es Salaam HDSS). Int J Epidemiol. 2017;46(3):801-8.
143. Rotarou E, Ueta K. Foreign Aid and Economic Development: Tanzania's Experience with ODA. The Kyoto Economic Review. 2009;78(2 (165)):157-89.
144. Miltenburg A. Quality of Maternity Care in Rural Tanzania: Understanding Local Realities and Identification of Opportunities for Improvement. Oslo: University of Oslo; 2019.
145. World Bank. Life expectancy at birth, total (years) - Tanzania [Internet]. 2023 [Available from: https://data.worldbank.org/indicator/SP.DYN.LE00.IN?locations=TZ.
146. Ministry of Health (MoH) [Tanzania Mainland], Ministry of Health (MoH) [Zanzibar], National Bureau of Statistics (NBS), Office of the Chief Government Statistician (OCGS), ICF. 2023 Tanzania Demographic and Health Survey and Malaria Indicator Survey 2022 Key Indicators Report. Dodoma, Tanzania, and Rockville, Maryland, USA: MoH, NBS, OCGS, and ICF; 2023.
147. Kigombola A, Lyimo J, Mizinduko M, Mkembela D, Maziku E, Kafura W, et al. Low engagement of key populations in HIV health services in Tanzania: analysis of community, legal and policy factors. Pan Afr Med J. 2023;45(Suppl 1):8.
148. Iliffe J. The Drive to the East. The African Aids Epidemic: A History: Boydell & Brewer; 2006. p. 19-32.
149. Maswanya E, Mutalemwa P, Shayo E. Drivers of HIV/AIDS epidemics in Tanzania mainland - “Case Study of Makete, Temeke, Geita, Lindi, Kigoma & Meru Districts”. Prime Minister's Office, Tanzania Commission for AIDS, UNAIDS; 2010.
150. Ministry of Health, Community, Development, Gender Elderly and Children, National AIDS Control Programme.¨. Implementation Framework for Pre-exposure prophylaxis of HIV in Tanzania Mainland. Tanzania, mainland: MoHCDEC, NACP; 2021.
151. Iliffe J. Causation: A Synthesis. The African Aids Epidemic: A History: Boydell & Brewer; 2006. p. 58-64.
152. Tanzania Commission for AIDS, Zanzibar AIDS Commission. Tanzania HIV Impact Survey (THIS) 2016-2017: Final Report. Dar es Salaam, Tanzania TACAIDS, ZAC; 2018.
153. Sia D, Onadja Y, Nandi A, Foro A, Brewer T. What lies behind gender inequalities in HIV/AIDS in sub-Saharan African countries: evidence from Kenya, Lesotho and Tanzania. Health Policy Plan. 2013;29(7):938-49.
154. UNICEF, Tanzania Ministry of Health, Community, Development, Gender, Elderly and Children. HIV and AIDS Budget Brief. Dar es Salaam, Tanzania: UNICEF and MOHCDGEC 2018.

155. Ministry of Health, Community, Development, Gender Elderly and Children, Programme NAC. Health Sector HIV and AIDS Strategic Plan IV (2017-2022) - Monitoring and Evaluation. Dar es Salaam: MoHCDEC, NACP; 2018.
156. Iliffe J. NGOs & the Evolution of Care. The African Aids Epidemic: A History: Boydell & Brewer; 2006. p. 98-111.
157. Training the community to popularise a safety-first "highway code". Special report: Tanzania. AIDS analysis Africa. 1995;5(2):8-10.
158. Kilimwiko L. Condoms hitch lift with truckers. WorldAIDS. 1991(17):9.
159. Moen K, Aggleton P, Leshabari MT, Middelthon A-L. Same-Sex Practicing Men in Tanzania from 1860 to 2010. Archives of Sexual Behavior. 2014;43(6):1065-82.
160. Ministry of Health, Community, Development, Gender Elderly and Children, (NACP) NACP. National Guideline on Comprehensive HIV Interventions for Key and Vulnerable Populations. 2.nd ed. Dar es Salaam, Tanzania: MoHDEC, NACP; 2017.
161. The Prime Minister's Office, Tanzania Commission for AIDS. National Multisectoral Strategic Framework for HIV and AIDS (2018/19-2022/23). 2018. Report No.: 4.
162. Ministry of Health and Social Welfare, (NACP) NACP. National Guideline for Comprehensive Package of HIV Interventions for Key Populations. Dar es Salaam, Tanzania2014.
163. Wambura M, Nyato DJ, Makyao N, Drake M, Kuringe E, Casalini C, et al. Programmatic mapping and size estimation of key populations to inform HIV programming in Tanzania. PloS one. 2020;15(1):e0228618.
164. Vu L, Tun W, Apicella L, Casalini C, Makyao N, Tsang S, et al. Community-based antiretroviral therapy (ART) delivery for female sex workers in Tanzania: intervention model and baseline findings. AIDS Care Psychological and Socio Medical Aspects of AIDS/HIV. 2019.
165. Mizinduko M, Moen K, Pinkowski Tersbøl B, Likindikoki SL, Alexander Ishungisa M, Leyna GH, et al. HIV testing and associated factors among female sex workers in Tanzania: approaching the first 90% target? AIDS care. 2021:1-9.
166. Mtawali CV, Mtawala CV. A Health Campaign in Tanganyika Territory. Community Development Bulletin. 1951;2(3):54-6.
167. Kamazima SR, Kazaura MR. The typology of female sex workers in Dar-es-Salaam: implications to HIV and AIDS interventions targeting female sex workers in Tanzania. East African journal of public health. 2012;9(2):62-9.
168. Kamazima S, Kazaura M. Exhaustive typologies of sex workers and sex buyers in the Tanzania-Uganda borderlands in the context of health promotion and communication targeting the sex industry in Kagera Region, Tanzania. Tanzania IJCR. 2018;10(5):69580-90.
169. International R. Women engaged in sex work and transcational sex in Tanzania - a formative assessment of the context and culture. Prepared for T-MARC Company; 2009.
170. Beckham SW, Shembilu CR, Winch PJ, Beyrer C, Kerrigan DL. 'If you have children, you have responsibilities': motherhood, sex work and HIV in southern Tanzania. Culture, health & sexuality. 2015;17(2):165-79.
171. Harling G, Muya A, Ortblad KF, Mashasi I, Dambach P, Ulenga N, et al. HIV risk and pre-exposure prophylaxis interest among female bar workers in Dar es Salaam: cross-sectional survey. BMJ open. 2019;9(3):e023272.
172. Ao T, Sam N, Manongi R, Seage G, Kapiga S. Social and behavioural determinants of consistent condom use among hotel and bar workers in Northern Tanzania. Int J STD AIDS. 2003;14(10):688-96.
173. Bryceson DF, Jønsson JB, Verbrugge H. Prostitution or partnership? Wifestyles in Tanzanian artisanal gold-mining settlements. J Mod Afr Stud. 2013;51(1):33-56.
174. Wamoyi J, Fenwick A, Urassa M, Zaba B, Stones W. "Women's bodies are shops": beliefs about transactional sex and implications for understanding gender power and HIV prevention in Tanzania. Arch Sex Behav. 2011;40(1):5-15.

175. Wamoyi J, Stobeanau K, Bobrova N, Abramsky T, Watts C. Transactional sex and risk for HIV infection in sub-Saharan Africa: a systematic review and meta-analysis. J Int AIDS Soc. 2016;19(1):20992-.
176. Wamoyi J, Ranganathan M, Kyegombe N, Stoebenau K. Improving the Measurement of Transactional Sex in Sub-Saharan Africa: A Critical Review. J Acquir Immune Defic Syndr. 2019;80.
177. Tanzania Penal Code Chapter 16 of the Laws (Revised) (Principal Legislation),, (1981).
178. Gaffey C. Tanzania Arrests 800 Sex Work Suspects in Prostitution Crackdown. Newsweek 90. 2016 March 16.
179. Van Bavel H. Beyond exploitation: towards a nuanced understanding of agency for adolescent female sex workers - evidence from Zanzibar and Morogoro. Cult Health Sex. 2017;19(1):76-90.
180. Mantsios A, Shembilu C, Mbwambo J, Likindikoki S, Beckham S, Mwampashi A, et al. "When you don't have money, he controls you": Financial security, community savings groups, and HIV risk among female sex workers in Iringa, Tanzania. J Int AIDS Soc. 2016;19 (Supplement 5):155.
181. Cooper JE, Dow WH, de Walque D, Keller AC, McCoy SI, Fernald LCH, et al. Female sex workers use power over their day-to-day lives to meet the condition of a conditional cash transfer intervention to incentivize safe sex. Social science & medicine (1982). 2017;181:148-57.
182. Mantsios A, Galai N, Mbwambo J, Likindikoki S, Shembilu C, Mwampashi A, et al. Community Savings Groups, Financial Security, and HIV Risk Among Female Sex Workers in Iringa, Tanzania. AIDS behav. 2018;22(11):3742-50.
183. Vu L, Tun W, Apicella L, Kidola J, Casalini C, Mbita G, et al. Community-based HIV treatment service delivery model for female sex workers in Tanzania: Evaluation findings. 2020.
184. Makyao N, Urasa P, Leornard S, Mbaga EJ, Leyna GH, Kagashe M, et al. HIV prevention using oral pre-exposure prophylaxis in the United Republic of Tanzania. Results from the Demonstration Project. Poster session presented at the 23rd International Aids Conference (AIDS 2020), San Fransisco and Aukland, US. 2020.
185. Faini D, Munseri P, Sandstrom E, Hanson C, Bakari M. Awareness, Willingness and Use of HIV Pre-Exposure Prophylaxis Among Female Sex Workers Living in Dar-es-Salaam, Tanzania. AIDS Behav. 2022;27(1):335-43.
186. Reed JB, Shrestha P, Were D, Chakare T, Mutegi J, Wakhutu B, et al. HIV PrEP is more than ART-lite: Longitudinal study of real-world PrEP services data identifies missing measures meaningful to HIV prevention programming. J Int AIDS Soc. 2021;24(10):e25827.
187. Martin VO, Tesha NA, Sunguya BF. Uptake of Oral HIV Pre-Exposure Prophylaxis (PrEP) and Associated Factors among Female Sex Workers in Tanga, Tanzania. Viruses. 2023;15(10).
188. Bronfenbrenner U. The ecology of human development: Experiments by nature and design: Harvard university press; 1979.
189. Center for Disease Control and Prevention. THe Socio-Ecological Model: A framework for prevention. United States,: National Center for Injury Prevention and Control, Division of Violence Prevention,; 2022.
190. Kaufman MR, Cornish F, Zimmerman RS, Johnson BT. Health behavior change models for HIV prevention and AIDS care: practical recommendations for a multi-level approach. J Acquir Immune Defic Syndr. 2014;66 Suppl 3(Suppl 3):250-8.
191. Rosenstock IM, Strecher VJ, Becker MH. The health belief model and HIV risk behavior change. Preventing AIDS: Theories and methods of behavioral interventions: Springer; 1994. p. 5-24.
192. Ajzen I. Understanding attitudes and predictiing social behavior. Englewood cliffs. 1980.
193. Ajzen I. From Intentions to Actions: A Theory of Planned Behavior. In: Kuhl J, Beckmann J, editors. Action Control: From Cognition to Behavior. Berlin, Heidelberg: Springer Berlin Heidelberg; 1985. p. 11-39.
194. Ma PHX, Chan ZCY, Loke AY. The Socio-Ecological Model Approach to Understanding Barriers and Facilitators to the Accessing of Health Services by Sex Workers: A Systematic Review. AIDS Behav. 2017;21(8):2412-38.

195. Fearon E, Phillips A, Mtetwa S, Chabata ST, Mushati P, Cambiano V, et al. How Can Programs Better Support Female Sex Workers to Avoid HIV Infection in Zimbabwe? A Prevention Cascade Analysis. J Acquir Immune Defic Syndr. 2019;81(1):24-35.
196. Mboup A, Diabaté S, Béhanzin L, Guédou FA, Zannou DM, Kêkê RK, et al. Determinants of HIV Preexposure Prophylaxis Adherence Among Female Sex Workers in a Demonstration Study in Cotonou, Benin: A Study of Behavioral and Demographic Factors. Sexually transmitted diseases. 2021;48(8):565-71.
197. Lancaster KE, MacLean SA, Lungu T, Mmodzi P, Hosseinipour MC, Hershow RB, et al. Socioecological Factors Related to Hazardous Alcohol use among Female Sex Workers in Lilongwe, Malawi: A Mixed Methods Study. Subst Use Misuse. 2018;53(5):782-91.
198. Connell CM, Gilreath TD, Aklin WM, Brex RA. Social-ecological influences on patterns of substance use among non-metropolitan high school students. Am J Community Psychol. 2010;45(1-2):36-48.
199. Pillen H. Critical Public Health. In: Liamputtong P, editor. Handbook of Social Sciences and Global Public Health. Cham: Springer International Publishing; 2023. p. 127-42.
200. Gubrium JF, Holstein JA. The SAGE Handbook of Qualitative Data Analysis. 2014 2024/02/19. London: SAGE Publications Ltd. Available from: https://methods.sagepub.com/book/the-sage-handbook-of-qualitative-data-analysis.
201. Rappaport J. Terms of empowerment/exemplars of prevention: Toward a theory for community psychology. American Journal of Community Psychology. 1987;15(2):121-48.
202. Zimmerman MA. Empowerment Theory. In: Rappaport J, Seidman E, editors. Handbook of Community Psychology. Boston, MA: Springer US; 2000. p. 43-63.
203. Adams R. Concept of Empowerment. In: Adams R, editor. Social Work and Empowerment. London: Macmillan Education UK; 1996. p. 1-24.
204. Cebral-Loureda M, Tamés-Muñoz E, Hernández-Baqueiro A. The Fertility of a Concept: A Bibliometric Review of Human Flourishing. Int J Environ Res Public Health. 2022;19(5):2586.
205. VanderWeele TJ. On the promotion of human flourishing. Proceedings of the National Academy of Sciences. 2017;114(31):8148-56.
206. Galtung J. Violence, peace, and peace research. J Peace Res. 1969;6(3):167-91.
207. Farmer PE, Nizeye B, Stulac S, Keshavjee S. Structural Violence and Clinical Medicine. PLoS Med. 2006;3(10):e449.
208. Conrad P, Bergey M. Medicalization: Sociological and Anthropological Perspectives. In: Wright JD, editor. International Encyclopedia of the Social & Behavioral Sciences (Second Edition). Oxford: Elsevier; 2015. p. 105-9.
209. Ivan I. The medicalization of life. J Med Ethics. 1975;1(2):73.
210. van Dijk W, Faber MJ, Tanke MA, Jeurissen PP, Westert GP. Medicalisation and Overdiagnosis: What Society Does to Medicine. Int J Health Policy Manag. 2016;5(11):619-22.
211. Kippax S, Stephenson N. Socialising the biomedical turn in HIV prevention: Anthem Press; 2016.
212. Syvertsen JL, Robertson Bazzi AM, Scheibe A, Adebajo S, Strathdee SA, Wechsberg WM. The promise and peril of pre-exposure prophylaxis (PrEP): using social science to inform prep interventions among female sex workers. Afr J Reprod Health. 2014;18(3 Spec No):74-83.
213. Kendall T, Albert C. Experiences of coercion to sterilize and forced sterilization among women living with HIV in Latin America. J Int AIDS Soc. 2015;18(1):19462.
214. Ahmed A, Mindy J. " At the hospital there are no human rights": reproductive and sexual rights violations of women living with HIV in Namibia. Namibian Women's Health Network (NWHN), Northeastern University Law School, and the International Human Rights Clinic at Harvard Law School (IHRC); 2013.
215. Creswell JW. Educational research : planning, conducting, and evaluating quantitative and qualitative research. 4th ed. Boston, Mass: Pearson; 2012.

216. Teddlie C, Tashakkori A. Overview of contemporary issues in mixed methods research. Sage handbook of mixed methods in social and behavioral research. 2010;2:1-44.
217. NIH Office of Behavioral and Social Sciences. Best practices for mixed methods research in the health sciences. Bethesda, US: National Institutes of Health.; 2018.
218. Johnson B, Gray R. A History of Philosophical and Theoretical Issues for Mixed Methods Research. 2010 2024/02/09. In: SAGE Handbook of Mixed Methods in Social & Behavioral Research [Internet]. Thousand Oaks, California: SAGE Publications, Inc. 2. Available from: https://methods.sagepub.com/book/sage-handbook-of-mixed-methods-social-behavioral-research-2e.
219. Blaikie N, Priest J. Social research: Paradigms in action: John Wiley & Sons; 2017.
220. Urcia IA. Comparisons of Adaptations in Grounded Theory and Phenomenology: Selecting the Specific Qualitative Research Methodology. International Journal of Qualitative Methods. 2021;20:16094069211045474.
221. Select Statistical Services. Population proportion - Sample size [Internet]. 2021 [Available from: https://select-statistics.co.uk/calculators/sample-size-calculator-population-proportion/.
222. Dhand NK, & Khatkar, M. S. Statulator: An online statistical calculator. Sample Size Calculator for Estimating a Single Proportion. 2014 [Available from: http://statulator.com/SampleSize/ss1P.html.
223. Schonlau M, Liebau E. Respondent-Driven Sampling. Stata J. 2012;12(1):72-93.
224. Johnston L. Introduction to HIV/AIDS and sexually transmitted infections surveillance. Module 4. Introduction to Respondent Driven Sampling. Regional Office for the Eastern Mediterranean.: World Health Organization; 2013.
225. Moen K, Aggleton P, Leshabari MT, Middelthon AL. Not at all so hard-to-reach: same-sex attracted men in Dar es Salaam. Cult Health Sex. 2012;14(2):195-208.
226. University of Oslo. "Nettskjema" 2022 [Available from: https://www.uio.no/english/services/it/adm-services/nettskjema/.
227. TSD Service Group. Services for Sensitive Data (TSD). IT department. University of Oslo. 2022.
228. Shrestha R, Altice FL, Huedo-Medina TB, Karki P, Copenhaver M. Willingness to Use Pre-Exposure Prophylaxis (PrEP): An Empirical Test of the Information-Motivation-Behavioral Skills (IMB) Model among High-Risk Drug Users in Treatment. AIDS Behav. 2017;21(5):1299-308.
229. Qu D, Zhong X, Xiao G, Dai J, Liang H, Huang A. Adherence to pre-exposure prophylaxis among men who have sex with men: A prospective cohort study. Int J Infect Dis. 2018;75:52-9.
230. Walsh JL. Applying the Information-Motivation-Behavioral Skills Model to Understand PrEP Intentions and Use Among Men Who Have Sex with Men. AIDS Behav. 2019;23(7):1904-16.
231. Klein H, Washington TA. The Pre-Exposure Prophylaxis (PrEP) Stigma Scale: Preliminary findings from a pilot study. Int Public Health J. 2019;11(2):185-95.
232. Babor F, Biddle-Higgins JC, Saunders JB, Monteiro MG. The Alcohol Use Disorders Identification Test (AUDIT): Guidelines for use in primary care. Second ed: The World Health Organization; 2001.
233. Brown RL, Leonard T, Saunders LA, Papasouliotis O. A two-item conjoint screen for alcohol and other drug problems. J Am Board Fam Med. 2001;14(2):95-106.
234. Broadhead WE, Gehlbach SH, De Gruy FV, Kaplan BH. The Duke–UNC Functional Social Support Questionnaire: Measurement of Social Support in Family Medicine Patients. Med Care. 1988;26(7):709-23.
235. Kroenke K, Spitzer RL, Williams JB. The Patient Health Questionnaire-2: validity of a two-item depression screener. Med Care. 2003;41(11):1284-92.
236. Kroenke K, Spitzer RL, Williams JB, Monahan PO, Löwe B. Anxiety disorders in primary care: prevalence, impairment, comorbidity, and detection. Ann Intern Med. 2007;146(5):317-25.
237. Kalichman SC, Simbayi LC, Kaufman M, Cain D, Jooste S. Alcohol use and sexual risks for HIV/AIDS in sub-Saharan Africa: systematic review of empirical findings. Prev Sci. 2007;8(2):141-51.

238. Vissoci JRN, Hertz J, El-Gabri D, Andrade Do Nascimento JR, Pestillo De Oliveira L, Mmbaga BT, et al. Cross-cultural adaptation and psychometric properties of the audit and cage questionnaires in Tanzanian Swahili for a traumatic brain injury population. Alcohol Alcohol. 2018;53(1):112-20.
239. Babor TF, Robaina K. The Alcohol Use Disorders Identification Test (AUDIT): A review of graded severity algorithms and national adaptations. Int J Alcohol Drug Res. 2016;5(2):17-24.
240. Sweat M, Kerrigan D, Moreno L, Rosario S, Gomez B, Jerez H, et al. Cost-effectiveness of environmental-structural communication interventions for HIV prevention in the female sex industry in the Dominican Republic. J Health Commun. 2006;11:123-42.
241. Greenland S, Daniel R, Pearce N. Outcome modelling strategies in epidemiology: traditional methods and basic alternatives. Int J Epidemiol. 2016;45(2):565-75.
242. Digitale JC, Martin JN, Glymour MM. Tutorial on directed acyclic graphs. J Clin Epidemiol. 2022;142:264-7.
243. Westreich D, Greenland S. The table 2 fallacy: presenting and interpreting confounder and modifier coefficients. Am J Epidemiol. 2013;177(4):292-8.
244. Textor J, Hardt J, Knüppel S. DAGitty: A Graphical Tool for Analyzing Causal Diagrams. Epidemiology (Cambridge, Mass). 2011;22(5).
245. Hendrickson ZM, Leddy AM, Galai N, Beckham SW, Davis W, Mbwambo JK, et al. Mobility for sex work and recent experiences of gender-based violence among female sex workers in Iringa, Tanzania: A longitudinal analysis. PloS one. 2021;16(6):e0252728.
246. Muller CJ, MacLehose RF. Estimating predicted probabilities from logistic regression: different methods correspond to different target populations. Int J Epidemiol. 2014;43(3):962-70.
247. Sperandei S, Bastos LS, Ribeiro-Alves M, Reis A, Bastos FI. Assessing logistic regression applied to respondent-driven sampling studies: a simulation study with an application to empirical data. Int J Soc Res Methodol. 2022:1-15.
248. Avery L, Rotondi N, McKnight C, Firestone M, Smylie J, Rotondi M. Unweighted regression models perform better than weighted regression techniques for respondent-driven sampling data: results from a simulation study. BMC Med Res Methodol. 2019;19(1):1-13.
249. Moen K, Middelthon A-L. Chapter 10 - Qualitative Research Methods. In: Laake P, Benestad HB, Olsen BR, editors. Research in Medical and Biological Sciences. 2.nd ed. Amsterdam: Academic Press; 2015. p. 321-78.
250. University of Oslo. Nettskjema diktafon-app. 2021.
251. Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol. 2006;3(2):77-101.
252. Braun V, Clarke V. One size fits all? What counts as quality practice in (reflexive) thematic analysis? Qual Res Psychol. 2020:1-25.
253. Whyte SR, Van der Geest S, Hardon A. Social lives of medicines: Cambridge University Press; 2002.
254. Mol A. The body multiple: Ontology in medical practice: Duke University Press; 2002.
255. Sandset T. PrEP, Pharmakon, and Ambivalence in the Era of Nordic HIV Prevention. Kvinder, Køn & Forskning. 2023;35(1):118-33.
256. Green J, Thorogood N. Qualitative methods for health research. 4.th ed: Sage Publications Ltd.; 2018. 1-440 p.
257. Purgato M, Barbui C. Dichotomizing rating scale scores in psychiatry: a bad idea? Epidemiol Psychiatr Sci. 2013;22(1):17-9.
258. Babor T.F H-BJC, ,Saunders J.B. , Monteiro M.G. . AUDIT: The alcohol use disorders identification test: Guidelines for use in primary health care. Geneva; 2001.
259. Tennant PWG, Murray EJ, Arnold KF, Berrie L, Fox MP, Gadd SC, et al. Use of directed acyclic graphs (DAGs) to identify confounders in applied health research: review and recommendations. Int J Epidemiol. 2021;50(2):620-32.
260. Carrasco MA, Nguyen TQ, Barrington C, Perez M, Donastorg Y, Kerrigan D. HIV Stigma Mediates the Association Between Social Cohesion and Consistent Condom Use Among Female Sex Workers Living with HIV in the Dominican Republic. Arch Sex Behav. 2018;47(5):1529-39.

261. Bowling A. Research methods in health: investigating health and health services: McGraw-hill education (UK); 2014.
262. Rothman KJ. Epidemiology: an introduction: Oxford university press; 2012.
263. Laake P, Lydersen S, Veierød MB. Medical statistics in clinical and epidemiological research. 1.st ed. Oslo, Norway: Gyldendal akademisk; 2012. 705 p.
264. Jakobsen JC, Gluud C, Wetterslev J, Winkel P. When and how should multiple imputation be used for handling missing data in randomised clinical trials – a practical guide with flowcharts. BMC Med Res Methodol. 2017;17(1):162.
265. Johnston L. Introduction to Respondent Driven Sampling-Manual2015.
266. Statista. Number of mobile cellular subscriptions per 100 inhabitants in Tanzania from 2000 to 2022 [Internet]. 2019 [cited 2022 12. Feb]. Available from: https://www.statista.com/statistics/510624/mobile-cellular-subscriptions-per-100-inhabitants-in-tanzania/.
267. Mbotwa CH, Kazaura MR, Moen K, Lichtwarck HO, Leshabari MT, Metta E, et al. Effect of an mHealth intervention on retention in HIV pre-exposure prophylaxis services among female sex workers: Preliminary evidence of the use of the Jichunge app in Dar es Salaam, Tanzania. Digit Health. 2023;9:20552076231170507.
268. Korstjens I, Moser A. Series: Practical guidance to qualitative research. Part 4: Trustworthiness and publishing. Eur J Gen Pract. 2018;24(1):120-4.
269. Malterud K. Kvalitative metoder i medisinsk forskning: en innføring. 3. utgave ed: Universitetsforlaget; 2011.
270. Kelly A, Westoby P. Participatory development practice: Using traditional and contemporary frameworks: Practical Action Publishing Rugby, UK; 2018.
271. Geldsetzer P, Bärnighausen K, Hettema A, McMahon SA, Dalal S, Chase RP, et al. A stepped-wedge randomized trial and qualitative survey of HIV pre-exposure prophylaxis uptake in the Eswatini population. Sci Transl Med. 2020;12(562).
272. Toledo L, McLellan-Lemal E, Henderson FL, Kebaabetswe PM. Knowledge, Attitudes, and Experiences of HIV Pre-Exposure Prophylaxis (PrEP) Trial Participants in Botswana. World J AIDS. 2015;5(2):10-20.
273. Van der Elst EM, Mbogua J, Operario D, Mutua G, Kuo C, Mugo P, et al. High acceptability of HIV pre-exposure prophylaxis but challenges in adherence and use: qualitative insights from a phase I trial of intermittent and daily PrEP in at-risk populations in Kenya. AIDS Behav. 2013;17(6):2162-72.
274. Eakle R, Weatherburn P, Bourne A. Understanding user perspectives of and preferences for oral PrEP for HIV prevention in the context of intervention scale-up: a synthesis of evidence from sub-Saharan Africa. J Int AIDS Soc. 2019;22 Suppl 4:e25306.
275. Maseko B, Hill LM, Phanga T, Bhushan N, Vansia D, Kamtsendero L, et al. Perceptions of and interest in HIV pre-exposure prophylaxis use among adolescent girls and young women in Lilongwe, Malawi. PloS one. 2020;15(1):e0226062.
276. Allen E, Gordon A, Krakower D, Hsu K. HIV preexposure prophylaxis for adolescents and young adults. Curr Opin Pediatr. 2017;29(4):399-406.
277. Howes A, Risher KA, Nguyen VK, Stevens O, Jia KM, Wolock TM, et al. Spatio-temporal estimates of HIV risk group proportions for adolescent girls and young women across 13 priority countries in sub-Saharan Africa. PLOS Glob Public Health. 2023;3(4):e0001731.
278. Ikeda DJ, Kidia K, Agins BD, Haberer JE, Tsai AC. Roll-out of HIV pre-exposure prophylaxis: a gateway to mental health promotion. BMJ Glob Health. 2021;6(12):e007212.
279. World Health Organization. Risks to Mental Health - An overview of Vulnerabilities and Risk Factors. 2012 27. August.
280. Cooper S. Global mental health and its critics: moving beyond the impasse. Crit Public Health. 2016;26(4):355-8.
281. Rhodes T. Risk environments and drug harms: a social science for harm reduction approach. The International journal on drug policy. 2009;20(3):193-201.

282. Celum C, Baeten JM. Lessons on PrEP from the SEARCH study in east Africa. Lancet HIV.

Appendices

Appendix 1: Paper I-III

I

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MDPI

Article

Harmful Alcohol Use and Associated Socio-Structural Factors among Female Sex Workers Initiating HIV Pre-Exposure Prophylaxis in Dar es Salaam, Tanzania

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Abstract: Harmful alcohol use is an important risk factor for premature mortality and morbidity and associated with increased HIV risk and lower uptake of and adherence to HIV interventions. This study aimed to assess the extent of harmful alcohol use and associated socio-structural vulnerability factors among female sex workers in Dar es Salaam, Tanzania, a key population in the HIV epidemic. Data from a study of female sex workers initiating pre-exposure prophylaxis (PrEP) recruited through respondent driven sampling were used. We assessed harmful alcohol use with the Alcohol Use Disorders Identification Test (AUDIT) defined as having an AUDIT score $\geq$ 16. Associations between harmful alcohol use and socio-structural factors were assessed using logistic regression with marginal standardization. Of the 470 women recruited, more than one third (37.3%) had a drinking pattern suggestive of harmful alcohol use. Such use was independently associated with sex work-related mobility (aPR: 1.36, 95% CI: 1.11–1.61), arrest/incarceration (aPR: 1.55, 95% CI: 1.27–1.84) and gender-based violence (aPR: 1.31, 95% CI: 1.06–1.56). The high prevalence of harmful alcohol use and the interconnectedness with socio-structural factors indicate a need for a holistic programmatic approach to health for female sex workers. Programming should not solely direct attention to individual behavior but also include strategies aiming to address socio-structural vulnerabilities.

Keywords: social epidemiology; sex work-related mobility; criminalization; alcohol-related disorders; gender-based violence; Sub-Saharan Africa; substance abuse; sex work; key population

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1. Introduction

Alcohol use is one of the leading risk factors for premature death and disability worldwide [1]. Three million people die each year from alcohol-related causes, and alcohol is responsible for 13.5% of all deaths among adults aged between 20 and 39 years [1]. The African continent carries the greatest burden of disease and injuries related to alcohol and has among the highest occurrences of heavy drinking among those who consume alcohol [1].

Social and cultural norms, as well as policies of various kinds, influence the use of alcohol, and those in lower socioeconomic positions experience more harm than those more affluent at the same level of consumption [2]. Among female sex workers in Sub-Saharan Africa (SSA), alcohol consumption is common [3,4]. Much commercial sex work takes place in establishments serving alcohol [3,5–9], and alcohol use can facilitate transition into and maintenance of sex work [3]. In Tanzania, research has found high rates of alcohol consumption among female sex workers [10,11]. In one study from Dar es Salaam, the country's largest city, more than 28% reported drinking more than four times a week, while nearly half (48%) consumed 5–6 units of alcohol or more on a typical day [12]. Furthermore, it is estimated that approximately 15% of women selling sex in Dar es Salaam, are HIV positive [12]. Alcohol use has been associated with unprotected sex and

HIV infection [1,13–21]. Moreover, drinking has the potential to exacerbate the course of HIV [15]. Alcohol has also been associated with poor uptake of, and lower adherence to, various HIV interventions [22–24].

While individual and behavioral determinants of alcohol use have been studied to some extent in SSA, socio-structural factors have received limited attention. Socio-ecological frameworks [25] can aid in the identification of socio-structural factors that may impact alcohol use among female sex workers. These frameworks do not limit themselves to focus on individual characteristics that put people at risk at the micro level but illustrate how the individual is situated within different layers of influence: from the individual level, via the interpersonal, community, and institutional levels, to the macro/structural level, and how these interact and shape health outcomes. Shannon et al. [26] have further developed a HIV structural determinants framework for female sex workers. Within this framework, macro-structural determinants, such as short-term mobility to sex work "hotspots" and the effects of criminalizing policies are taken into consideration. Additionally, determinants at the community and interpersonal levels, such as gender-based violence (GBV), stigma and social support, are highlighted. A few empirical studies from SSA have indeed found an association between GBV against female sex workers and alcohol use [6,9,27,28], but apart from this, studies into the relationships between socio-structural factors and alcohol use among female sex workers in Africa are scarce.

To achieve the global prevention and treatment goals in connection with harmful alcohol use [29,30], investigating potential links between socio-structural factors and harmful alcohol use among HIV at-risk populations is important. Failing to address these factors may render prevention efforts largely ineffective. Therefore, in this study, we aimed to assess associations between some potential socio-structural determinants (mobility, incarceration, GBV, stigma and social support) and harmful alcohol use among female sex workers in Tanzania. Additionally, for the first time within this population in Tanzania, we sought to estimate the extent of harmful alcohol use using the standard composite measure Alcohol Use Disorders Identification Test (AUDIT) [31].

2. Materials and Methods

2.1. Study Design and Participants

This paper presents findings from a baseline survey carried out as part of a quasi-experimental study evaluating the effectiveness of a mobile phone application in improving adherence to PrEP among female sex workers in Dar es Salaam, Tanzania. The city has a population of more than five million [32], and an HIV prevalence of 6.3% among women [33]. Being a metropolitan city, Dar es Salaam has one of the largest concentrations of female sex workers in the country, estimated to be around 9500 [12,34].

Female sex workers were defined as women who had exchanged sex for money or goods during the last three months prior to recruitment. Participants were eligible if they were 18 years or older, had lived in Dar es Salaam for at least 6 months, owned a smartphone, and were eligible for PrEP. The eligibility criteria for PrEP initiation were being HIV seronegative, being at substantial risk of HIV infection with no suspicion of acute HIV infection, having serum creatinine clearance > 60 ml/min and being willing to consent for and use PrEP as prescribed [35].

2.2. Procedures

In collaboration with a local clinic, we recruited participants using respondent-driven sampling (RDS) [36]. RDS is a modified "snowball-sampling" technique in which participants recruit from their own network, but unlike in snowball-sampling, each recruit must give an estimate of their network size. This information is used to calculate probability weights to account for the non-random nature of the sampling with the aim of arriving at a more representative sample [36]. We selected nine initial study participants (so-called "seeds") with diverse characteristics. Each seed was given three recruitment coupons and encouraged to invite other female sex workers to take part in the study. These were in turn

asked to invite yet other participants, thus setting off a process that led to several waves of recruitment. Recruitment continued until the desired sample size had been achieved. Participants received 8000 Tanzanian Shillings (≈4 USD) as compensation for their transportation costs and the time spent participating in the study, and 4000 TZS (≈2 USD) for each new study participant they recruited.

With regard to the analysis in this paper, a sample size of 383 would be required based on a single proportion sample size calculation with a confidence level of 95%, a 5% margin of error, and estimated 50% of participants drinking excessively [37]. The mother study final recruited sample was 470 women.

After being assessed for eligibility and consenting to study participation, trained research assistants interviewed participants face to face during their first clinic visit, using a survey questionnaire prepared as part of the mother-study. The questionnaire had been developed in English and translated to Swahili by Swahili-speaking members of the team. The translation was quality assured by the other researchers and pre-tested among research assistants and members of the sex worker community to assure that questions were understood and captured the intended meaning. Before the survey started, we had installed the questionnaire into "Nettskjema", an online tool for conducting surveys, developed by the University of Oslo [38]. It enabled the research assistants to directly plot respondents' answers into the questionnaire solution while conducting the interviews using hand-held tablets. Data were encrypted and directly transferred to a highly safe storage platform, TSD [39]. This process limited the use of pen and paper, which was only needed during the screening and consent process and by the clinic for their medical records. The recruitment of study participants and baseline data collection took place between March and July 2021.

2.3. Instruments and Measures

2.3.1. The Survey Questionnaire

The survey questionnaire contained 13 sections and covered topics assessed to be of relevance for PrEP use. It was developed based on a review of literature and informed by socio-ecological frameworks [25] and previous studies among key populations conducted by members of the research team. Questionnaire items included were alcohol consumption, drug use, socio-demographic characteristics, sex work history, sexual practices, socio-structural determinants, HIV knowledge, access to and satisfaction with health services, PrEP motivation, behavioral skills and self-efficacy, and questions relating to mobile health. We used previously validated scales where available, such as AUDIT to measure alcohol use [31], the female sex worker stigma scale [37], PHQ2 and GAD-2 assessing mental distress [40,41], the Duke UNC-Functional Social Support Questionnaire to measure social support [42], and a PrEP stigma scale [43]. Details related to items relevant for this analysis are presented below.

2.3.2. Outcome: Alcohol Use Assessment

Alcohol use was assessed using the "Alcohol Use Disorders Identification Test" (AUDIT) [31]. This 10-item measure has been developed by the WHO to aid health practitioners in identifying people who could benefit from interventions aiming at reduced alcohol consumption. We used a Swahili version which has been validated and has displayed good psychometric properties among traumatic brain injury patients in Tanzania [44], with only minor modifications in wording. The instrument screens for hazardous and harmful alcohol use and alcohol dependency. The three first questions relate to hazardous drinking, defined as drinking that increases the risk of harmful consequences although the user has no sign of any disorder. The questions inquire about drinking frequency, typical amount of alcohol intake, and frequency of heavy drinking. Four questions in the tool are specifically aiming to capture harmful alcohol use and includes questions on blackouts, guilt, injuries, and other people's concern about the person's alcohol intake. Furthermore, the instrument elicits information on typical dependency signs, such as increased salience of drinking, impaired control over drinking, and morning drinking. The composite

score ranges from 0 to 40. WHO suggests that scores between 8 and 15 be categorized as hazardous use, scores between 16 and 19 as harmful use, and scores above 20 as likely dependency [45]. In this study we used a cut-off score of 16, as this would estimate the proportion of women with either a harmful pattern of alcohol use or likely dependency. Individuals in both categories are in need of counselling, monitoring and/or treatment as per the WHO guideline [45]. Women who reported no drinking during the past year did not complete the AUDIT questionnaire since their total score would not exceed 6, and they were automatically included in the low-risk group without further assessment. In addition to the AUDIT questions, we also asked a question about drinking while doing sex work. This was done to capture context specific drinking related to the women's occupation.

2.3.3. Socio-Structural Factors and Other Covariates

The questionnaire further included questions aiming to elicit socio-structural vulnerability: gender-based violence, arrest/incarceration, short-term mobility, stigma, and low social support. The first three of these domains were assessed using single item questions with dichotomous response categories (yes/no). In the analysis, we merged two questions (on sexual assault and on violence, respectively) to create a single variable for gender-based violence. The questions were "Have you experienced physical violence (like being beaten) during the last 12 months?" and "Have you been forced to have sex during the last six months?" If participants confirmed to either, they were asked who the perpetuator(s) were. To assess mobility participants were asked: "Within the last 6 months have you ever travelled to another city or county to perform sex work?" Finally, we measured experiences with law enforcement with the question: "Have you been arrested by the police the last 12 months?" If the participants confirmed, we also inquired about the nature of the offence.

Stigma related to sex work was assessed using a 13-item, four-point Likert scale previously validated by research teams working with female sex workers in the Dominican Republic and Tanzania [37] The development of this measure has been informed by the HIV Berger Stigma Scale [46] and adapted to assess aspects of sex work stigma. The FSW stigma scale included statements such as "It's easier to avoid friendships than worry about telling others you are a sex worker" with answer options ranging from "strongly agree" to "strongly disagree". The higher the score, the more stigma (range 13–52).

We used an eight statement five-point Likert scale, the Duke UNC-Functional Social Support Questionnaire [42], to measure social support. The scale was originally developed in the US, but has later been tested in Rwanda and has demonstrated good convergent and discriminant validity among HIV positive men and women [47]. It includes statements such as "I have people who cares about what happens to me" and "I get chances to talk to someone I trust about my personal or family problems". Answer options ranged from "Much less than I would like" to "As much as I would like", with higher scores representing increased social support (range 1–5). The FSW stigma scale and the social support scale were dichotomized at the median. Reliability coefficients for the scales were good, both at 0.88.

Other variables of interest for this analysis were sociodemographic factors and factors related to sex work such as the number of years that had passed since the person sold sex for the first time, the number of clients per month, whether the person had any other work, and any drug use. These circumstances were hypothesized to be related to the socio-structural exposures and harmful alcohol use.

2.4. Data Analysis

We estimated proportions for categorical variables, while medians with interquartile ranges (IQR) were calculated for continuous variables. When using RDS recruitment, participants with larger networks are more likely to be overrepresented in the sample. Weights were thus calculated as the inverse of a participants' network size and used when estimating proportions [36]. We performed Chi-square tests to assess associations between harmful alcohol use (AUDIT $\geq$ 16) and socio-demographic and socio-structural factors. To

estimate independent effects of the three socio-structural exposures found significant in the bivariate analyses, we built three separate models with harmful alcohol use as the outcome.

This analytic strategy avoids "the table 2 fallacy" [48] where two or more coefficients in one single multivariable model are interpreted as estimates for meaningful effects. It allows adjusting for different potential confounders for separate exposure-outcome pairs. To aid in the decision of which variables to adjust for, we drew three directed acyclic graphs (DAGs) using the software tool "DAGitty" [49], one for each of the three exposures (GBV, mobility and arrest incarceration) and harmful alcohol use. In the final models, we adjusted for variables with p-values less than 0.2 in bivariate analysis, as well as for age. When drawing the DAGs, we were guided by socio-ecological theory, former research, and plausible assumptions about relationships between the variables. Given that the outcome of interest was common and the odds ratio (OR) would thus have overestimated the relative risk (RR), we used logistic regression and consecutively marginal standardization to compute prevalence ratios (PR) and adjusted prevalence ratios (aPR) [50]. The analyses were conducted using unweighted data as there is no consensus on how to best perform analyses of associations between two variables with RDS data [36,51]. Studies that have compared the use of weighted and unweighted regression have found that weighted regression can introduce bias and high type 1 error rates [51,52], partly due to the dependence on reported network size. Unweighted regression has been found to perform better using both simulated and real-life data suggesting that this is the preferable approach [51,52]. All analysis were two-tailed, and the significance level was set at 5%. We used STATA/SE 16.0 (StataCorp2019, College Station, TX, USA) for all analysis.

2.5. Ethical Considerations

The study received ethical clearance from the Ethical Review Committee of the Muhimbili University of Health and Allied Sciences (MUHAS), the Tanzania National Institute of Medical Research (NIMR), and the Regional Committee for Medical and Health Research Ethics (REK) in Norway. Foreign investigators received a research permit from the Tanzania Commission for Science and Technology (COSTECH). All participants provided written consent to take part in the study after being informed about the study's aims and procedures.

3. Results

3.1. Socio-Demographic and Sex Work-Related Characteristics

A total of 470 participants with a median age of 25 years (IQR: 22–29) were recruited. Table 1 presents the distribution of their socio-demographic and socio-structural characteristics. Three quarters (361; 75.8%) had never been married and 442 (90.2%) reported to have completed primary education. The median monthly income from sex work was 300,000 Tanzanian shillings (≈130 USD). Nearly two thirds (283; 59.4%) of the participants did not engage in any other income-generating work (or studies) besides sex work. About half (255; 46.2%) had started sex work five or more years earlier. The median number of clients (vaginal sex) per month was 15 (IQR: 6–30).

Table 1. Distributions of socio-demographic and socio-structural characteristics of the female sex workers (N = 470).

Variable	*n*	Unweighted Proportion % (95% CI)	Weighted Proportion % (95% CI)
Age (years)			
18–24	199	42.3 (37.9–46.9)	46.3 (39.9–52.8)
25–34	226	48.1 (43.6–52.6)	43.4 (37.2–49.9)
≥35	45	9.6 (7.2–12.6)	10.3 (6.3–16.4)

Table 1. *Cont.*

Variable	*n*	Unweighted Proportion % (95% CI)	Weighted Proportion % (95% CI)
Marital status			
Never married	361	76.8 (72.8–80.4)	75.8 (69.5–81.2)
Formerly married/currently/married/cohabiting	109	23.2 (19.6–27.2)	24.2 (18.8–30.5)
Highest educational level			
No formal/some primary	28	6.0 (4.1–8.5)	9.7 (5.4–16.9)
Completed primary	165	35.1 (30.9–39.5)	36.9 (31.0–43.3)
Some secondary	138	29.4 (25.4–33.7)	27.2 (21.8–33.4)
Completed secondary or above	139	29.6 (25.6–33.9)	26.1 (21.3–31.6)
Monthly income from sex work * (TZS †)			
<150,000	73	15.9 (12.9–19.6)	19.1 (14.3—25.0)
150,000–299,999	151	33.0 (28.8–37.4)	28.6 (23.3–34.5)
300,000–449,999	144	31.4 (27.3–35.9)	32.8 (26.6–39.6)
≥450,000	90	19.7 (16.3–23.6)	19.5 (14.7–25.5)
Years since started sex work			
<5	215	45.7 (41.3–50.3)	53.8 (47.2–60.2)
≥5	255	54.3 (49.7–58.7)	46.2 (39.8–52.8)
Number of clients/month (vaginal sex)			
<10	124	26.7 (22.8–30.9)	33.9 (27.7–40.8)
10–29	169	36.3 (32.1–40.8)	35.5 (29.6–42.0)
≥30	172	37.0 (32.7–41.5)	30.5 (25.1–36.6)
Have other work besides sex work			
Yes	187	39.8 (35.4–44.3)	40.6 (34.4–47.1)
No	283	60.2 (55.7–64.6)	59.4 (52.9–65.6)
Female sex worker stigma score ‡			
<30	205	44.9 (40.3–49.5)	44.5 (38.1–51.2)
≥30	252	55.1 (50.5–59.7)	55.5 (50.6–63.6)
Social support score (DUFSS) §||			
≤3	178	38.1 (33.8–42.6)	40.0 (33.5–46.9)
>3	289	61.9 (57.4–66.2)	60.0 (53.1–66.5)
Gender-based violence last 12 months ¶			
Yes	241	51.5 (47.0–56.0)	43.7 (37.5–50.2)
No	227	48.5 (44.0–53.0)	56.3 (50.0–62.5)
Arrest/incarceration last 12 months			
Yes	126	26.8 (23.0–31.0)	20.6 (16.1–26.0)
No	344	73.2 (69.0–77.0)	79.4 (74.0–83.9)
Reason for arrest **			
Sex work	75	60.0 (51.1–68.3)	54.7 (41.0–67.6)
Other reasons	50	40.0 (31.7–48.9)	45.4 (32.4–59.0)
Sex work-related mobility last 6 months			
Yes	179	38.1 (33.8–42.6)	28.4 (23.5–33.8)
No	291	61.9 (57.4–66.2)	71.6 (66.2–76.5)
Lifetime drug use			
Yes	64	13.6 (10.8–17.0)	8.3 (6.0–11.4)
No	406	86.4 (83.0–89.2)	91.7 (88.6–94.0)

* 12 missing observations. † 1 USD ≈ 2000 TZS (Tanzanian shillings). ‡ 13 missing observations. § Duke UNC-functional Social Support Questionnaire (DUFSS). || Three missing observations; ¶ Two missing observations. ** Among those reporting arrest the last 12 months. One missing observation.

3.2. Socio-Structural Factors

The median female sex worker stigma score was 31 (IQR: 27–35), whereas the median social support score was 3.4 (IQR: 2.5–4.5). Overall, 241 (43.7%) of the women had

experienced GBV during the past 12 months, and the most frequent perpetrators had been sex work clients. One in five (126; 20.6%) had been arrested by the police in the same period. Of these, 75 (54.7%) had been arrested for selling sex. A total of 179 (28.4 %) participants had travelled to another city or country to do sex work in the six months-period preceding recruitment.

3.3. Alcohol and Drug Use

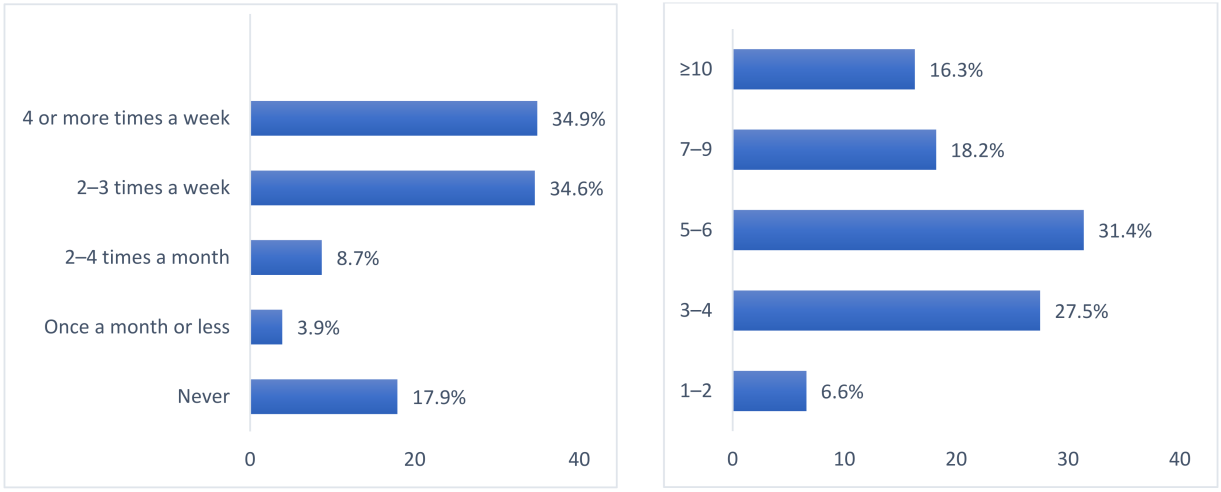
As Table 2 illustrates, 405 (86.2%) participants reported that they had used alcohol in the year preceding the survey. Of these, 360 (69.6%) had an AUDIT score of 8 or above (indicative of "hazardous alcohol use") while 230 (37.3%) had an AUDIT score of 16 or more (suggestive of "harmful alcohol use" or "alcohol dependency"). More than half of the whole sample (296; 53.6%) had been drinking alcohol the last time they had sex with a client.

Table 2. Distributions and patterns of alcohol use among female sex workers (N = 470).

Alcohol Use	*n*	Unweighted Proportion % (95% CI)	Weighted Proportion % (95% CI)
Reported drinking alcohol the past year			
Yes	405	86.2 (82.7–89.0)	82.1 (75.8–87.0)
No	65	13.8 (11.0–17.3)	17.9 (13.0–24.2)
Drinking at last sexual encounter with a client †			
Yes	296	63.1 (58.6–67.4)	53.6 (47.0–60.2)
No	173 *	36.8 (32.6–41.4)	46.4 (39.8–53.0)
Hazardous alcohol use (AUDIT ≥ 8)			
Yes	360	76.6 (72.5–80.2)	69.6 (62.6–75.9)
No	110 *	23.4 (19.8–27.5)	30.4 (24.1–37.4)
Harmful alcohol use (AUDIT ≥ 16)			
Yes	230	48.9 (44.4–53.5)	37.3 (31.7–43.4)
No	240 *	51.1 (46.5–55.6)	62.7 (56.6–68.3)

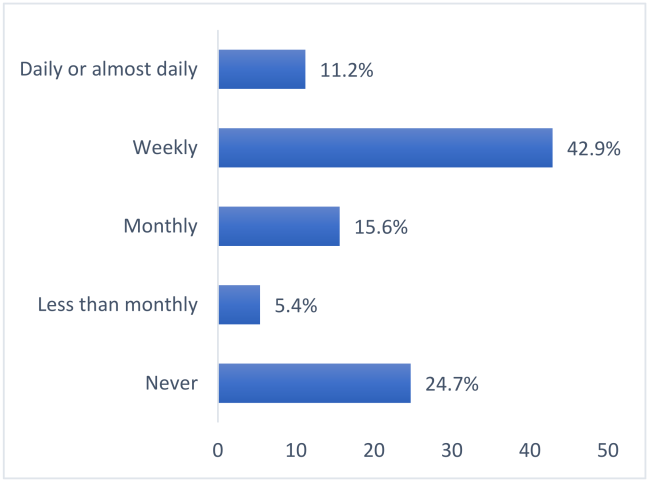
* Participants who reported not drinking last year are included in "No"-category. † 1 missing observation.

To allow for comparison with other studies, we present the distribution of responses for three of the AUDIT questions in Figure 1a–c. These questions make up the shorter version of AUDIT, called AUDIT-C [53].



(**a**) (**b**)

Figure 1. *Cont.*



(**c**)

Figure 1. AUDIT C. Proportions are weighted: (**a**) Distributions of reported frequency of drinking alcohol among all participants (n = 470); (**b**) Distributions of reported number of drinks on a typical day when drinking among participants reporting drinking the previous year (n = 405); (c) Distributions of reported frequency of "binge drinking" (drinking ≥ 6 units of alcohol on one occasion) among participants reporting drinking the previous year (n = 405).

3.4. Factors Associated with Harmful Alcohol Use

Arrest/incarceration, GBV and sex work-related mobility were all significantly associated with harmful alcohol use (AUDIT ≥ 16) in bivariate analysis (Table 3). Additionally, the number of years since starting sex work, the number of clients per month, not having other work than sex work, and having ever used drugs were also significantly associated with harmful alcohol use (Table 3).

Table 3. Distributions of sociodemographic and socio-structural factors by harmful alcohol use (AUDIT scores ≥ 16).

Socio-Demographic and Socio-Structural Factors	N	Harmful Alcohol Use: N (%)	*p*-Value
Age (years)			0.48
18–24	199	92 (46.2)	
25–34	226	113 (50.0)	
≥35	45	25 (55.6)	
Marital status			0.11
Never married	361	184 (51.0)	
Formerly married/currently married/cohabiting	109	46 (42.2)	
Highest educational attainment			0.73
No formal/some primary	28	15 (53.6)	
Completed primary	165	81 (49.1)	
Some secondary	138	71 (51.5)	
Completed secondary or above	139	63 (45.3)	
Monthly income from sex work (TZS *)			0.34
<150,000	73	30 (41.1)	
150,000–299,999	151	75 (49.7)	
300,000–449,999	144	78 (54.2)	
≥450,000	90	44 (48.9)	
Years since started sex work			<0.01
<5	215	86 (40.0)	
≥5	255	144 (56.5)	

Table 3. *Cont.*

Socio-Demographic and Socio-Structural Factors	N	Harmful Alcohol Use: N (%)	*p*-Value
Number of clients month (vaginal sex)			0.01
<10	124	46 (37.1)	
10–29	169	88 (52.1)	
≥30	172	93 (54.1)	
Have other work besides sex work			
Yes	187	81 (43.3)	0.05
No	283	149 (52.7)	
Female sex worker stigma score			
<30	205	110 (53.7)	0.11
≥30	252	116 (46.0)	
Social support (DUFSS †)			0.48
≤3	178	91 (51.1)	
>3	289	138 (47.7)	
Gender-based violence last 12 months			<0.01
Yes	241	145 (60.2)	
No	227	84 (37.0)	
Arrest/incarceration last 12 months			<0.01
Yes	126	89 (70.6)	
No	344	141 (41.0)	
Sex work-related mobility last 6 months			<0.01
Yes	179	106 (59.2)	
No	291	124 (42.6)	
Lifetime drug use			<0.01
Yes	64	43 (67.2)	
No	406	187 (46.1)	

* 1 USD ≈ 2000 TZS (Tanzanian shillings). † Duke UNC-functional Social Support Questionnaire (DUFSS).

3.5. Socio-Structural Factors Independently Associated with Harmful Alcohol Use

The results from the bivariate and the multivariable regression models of the association between socio-structural factors and harmful alcohol use are presented in Table 4. We found that participants with a history of arrest/incarceration during the past 12 months had a 55% higher prevalence of harmful drinking than those who had not been incarcerated (aPR-adjusted prevalence ratio: 1.55, 95% CI: 1.27, 1.84). Female sex workers who had experienced GBV during the past 12 months had an aPR of 1.31 (95% CI: 1.06–1.56) compared to those who had not. Moreover, mobility to another city for sex work was independently associated with a 36% increased prevalence of harmful alcohol use as compared to participants who had not travelled (aPR, 1.36. 95% CI: 1.11–1.61).

Table 4. Regression analysis of the association between socio-structural factors and harmful alcohol use.

Independent Variable	Crude PR (95% CI)	Adjusted PR (95% CI)	*p*-Value for APR
Arrest/Incarceration last 12 months *	1.72 (1.45–2.04)	1.55 (1.27–1.84)	<0.01
Gender based-violence last 12 months †	1.63 (1.33–1.98)	1.31 (1.06–1.56)	<0.01
Sex work related mobility last 6 months ‡	1.39 (1.16–1.66)	1.36 (1.11–1.61)	<0.01

* Adjusted for FSW stigma, age, drug use ever, marital status, mobility, number of partners, other job than sex work, years in sex work (n = 452); † Adjusted for FSW stigma, age, drug use ever, incarceration, marital status, mobility, number of partners, other job than sex work, years in sex work (n = 450); ‡ Adjusted for FSW stigma, age, marital status, other work than sex work, years in sex work (n = 457).

4. Discussion

We found that harmful alcohol use was prevalent among female sex workers initiating pre-exposure prophylaxis in Dar es Salaam, Tanzania. Three socio-structural factors, namely sex work-related mobility, arrest, and gender-based violence, were independently associated with harmful alcohol use, suggesting an intersection of vulnerabilities.

The proportion of study participants engaging in harmful alcohol use was high compared to what has been reported from the neighboring countries of Kenya, Malawi, and Uganda, where AUDIT scores have ranged from 9.5% to 27% among female sex workers [17,54,55]. The higher prevalence in our sample is consistent with the higher overall alcohol use in Tanzania (9.4 L per capita per year) compared to that of Kenya (3.4 L) and Malawi (3.7 L) [1]. Ugandans, however, have equally high alcohol consumption as Tanzanians [1].

Female sex workers are confronted with multiple health risks. Studies indicate that female sex workers in diverse settings are disproportionally affected by violence [56], sexually transmitted infections [26,57] and adverse mental health outcomes [58]. Harmful alcohol use with its social and health-related consequences adds to this burden. As alcohol use can increase HIV risk, it has the potential to maintain or exacerbate already existing inequalities within the HIV epidemic. Moreover, a recent study found that alcohol use was associated with non-adherence to PrEP [24]. This finding, combined with the high prevalence of harmful alcohol drinking in our study and other studies, suggest that incorporating alcohol screening, counseling, and treatment in PrEP provision in Tanzania and similar settings might be warranted.

With alcohol use disorders known to be impacted by societal factors, it is however not likely that individual-oriented strategies to reduce alcohol consumption will be sufficient [59,60]. Epidemiological HIV prevention research typically focuses on individual risk, and in the literature on HIV and female sex workers, alcohol use is usually referred to as a "behavioral risk factor". This body of research tells an incomplete story by placing the main responsibility on the individual whilst ignoring interpersonal, organizational, community and public policy factors that take part in shaping these risks. We therefore sough to explore some of this socio-structural vulnerability and its relation to harmful alcohol use by focusing on socio-structural factors which have been identified as important determinants for HIV among female sex workers [26].

In our sample, about half of the participants had experienced GBV and this was associated with a 31% increased prevalence of harmful alcohol use. An association between violence and problem drinking has previously been established [61], and earlier research among women engaging in transactional sex in SSA, including in Tanzania, has also found such a relationship [6,9,17,27,28,62,63]. Few previous studies have, however, used composite measures such as AUDIT to investigate the association with harmful alcohol use in a more comprehensive way. Qualitative research from Tanzania has explored how aspects of sex work, such as alcohol use, facilitates risks for HIV and gender-based violence [64]. They found that this occurred in interactions with clients at three moments in time: when meeting clients at the bar, where alcohol could increase the risk for violence; during negotiations, when clients could become violent if a sex worker refused sex after drinking alcohol purchased by the prospective client; and during sex, when alcohol intake could render the women unconscious and facilitate unwanted or unprotected sex [64]. Other studies, especially from high-income countries, demonstrate how the relationship between alcohol use and GBV may also work in the opposite direction, i.e., gender-based violence can lead to problematic drinking [61,65,66]. The effect measured in cross-sectional studies (like ours) is likely a consequence of both these relationships.

About a quarter of the participants in this study reported to have been arrested during the past 12 months preceding the survey and the most common reason cited was sex work (60%). We found that women who had been arrested were 55 % more likely to report harmful alcohol use than those who had not. Criminalization of sex work has been linked to poorer health-related outcomes among female sex workers, including increased HIV risk

and higher levels of inconsistent condom use, stigma, and food and income instability [26]. Contact with law enforcement, such as arrests, has, as shown in studies from high income settings, the potential to inflict physical and psychological ill health [67,68]. It is possible that stress processes that partly explain the effect of arrests/incarceration on depression and anxiety [68] could also influence alcohol consumption. It is however also plausible that part of the association can be explained by the increased risk of getting arrested that is experienced by people engaging in harmful alcohol use.

The third socio-structural factor we found to be associated with harmful alcohol use, was sex work-related mobility. Women who had moved for sex work during the past 6 months had a 36% higher relative likelihood of engaging in harmful alcohol use than those who had not been mobile. Mobility has been linked to both positive and negative health outcomes for sex workers [69]. Typically, intra-urban and intra-district mobility and short-term movement to so-called "hotspots" for sex work has been shown to increase HIV vulnerability [69]. In this study, mobility was common, with over two thirds of the participants having moved for sex work during the past 6 months. Mobility can, for some, reflect social and economic instability. One the other hand, sex workers who temporarily find themselves away from known environments may receive less support from their social networks and for that reason experience added vulnerability to outer stressors. Mobility has for instance been found to be a risk factor for gender-based violence among female sex workers in Iringa, Tanzania [70,71]. With regard to the relationship between mobility and alcohol use, a study from India by Saggurti et al. [72] with over 5000 mobile sex workers, found that mobility was associated with alcohol consumption before sex. There is however a need for more longitudinal quantitative studies to measure the direction of effect and for qualitative studies to explore this relationship among sex workers.

The findings of this study have implications for how alcohol use practices should be addressed and suggest that public health would benefit from engaging with socio-structural factors identified in this study. Individualized behavior change strategies can be effective, at least in the short-term [27], but are likely to be insufficient alone [73]. Community empowerment approaches addressing socio-structural challenges such as GBV and social cohesion among female sex workers in Tanzania have proven effective, both for HIV prevention and treatment outcomes and for reduced alcohol consumption [74]. Similar interventions could be expanded and tested. Additionally, efforts to improve female sex workers access to care while travelling, have also been suggested previously [70]. The interventions should be flexible and allow for prevention and treatment seeking at multiple locations regardless of city of origin. Finally, structural interventions and policies aiming to ameliorate the life circumstances of female sex workers by reducing their exposure to arrest and incarceration will likely be of impact. It should also be noted that alcohol specific structural level interventions, such as restrictions on availability of alcohol, alcohol advertising and alcohol taxations have only to a limited degree been utilized in SSA including in Tanzania [1] and might represent effective policy approaches. It is however unclear if such restrictions will have the anticipated effect among a group such as female sex workers, without addressing other co-occurring structural vulnerabilities such as those highlighted in this paper.

The results presented in this study should be interpreted considering some limitations. Firstly, the cross-sectional nature of the study limits our ability to draw causal inferences. Our aim was however to assess whether relationships were present in exploratory analyses as a way of directing attention to what we expected would be overlapping risks confronted by female sex workers and discuss how these relationships might be understood. With regard to the independent variables, our study did not distinguish between short term arrest/detention and longer in-prison sentences, nor between short and long-term mobility in connection with sex work. Future research should expand on these categories to elucidate these relationships further. We did not find statistically significant relationships between female sex work stigma and social support, and harmful alcohol use. Alternate analyses using the summary scores as continuous variables instead of categorical exposures did

not change this conclusion. It is possible that the lack of an association between social support and harmful alcohol use could be attributed to drinking practices promoting social contact with other sex workers within drinking venues. This could have neutralized any negative effect that social support might have had. We found it surprising that female sex work stigma was not associated with harmful alcohol use. One possible explanation could be that women with higher stigma, as a response, would limit visits to bars or other avenues where they could be stigmatized, thus also limiting alcohol intake. We furthermore acknowledge that our study participants, who were enrolled in a PrEP program and a mHealth study, may not be representative of all female sex workers in Tanzania. Given the challenges related to the execution of RDS and the fact that this sampling approach does not equate to random sampling, we have presented both unweighted and weighted proportions to illustrate the differences in some of the estimates. As in all studies on topics that may be perceived to be sensitive, desirability bias might have affected the way people answered questions. Despite the mentioned limitations, the study provides important new knowledge about a significant health challenge facing a population with several health-related vulnerabilities.

5. Conclusions

Our study supports earlier research that has documented that problematic alcohol use is common among female sex workers. To our knowledge, it is the first study conducted among female sex workers in Tanzania that has used the AUDIT to assess harmful alcohol use. The demonstrated interconnectedness between socio-structural factors and harmful alcohol use underscores the importance of using a socio-structural determinants framework to understand the vulnerabilities of, and the health risks facing, female sex workers in resource-limited settings. Efforts should be made on policy, community, and local levels to address the overlapping conditions of harmful alcohol use and HIV, and their intersections with these socio-structural factors. The findings of this study strongly support the call from WHO to increase policy and research focus on harmful alcohol use [29]. A particular focus should be directed to this understudied topic among female sex workers.

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Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board (Ethics Committee) of the Muhimbili University of Health and Allied Sciences (MUHAS-REC-10-2019-057) and National Health Research Ethics Committee (NIMR/HQ/R.8a/Vol.IX/3454) in Tanzania and the Regional Committee for Medical and Research Ethics (Ref. 33675), in Norway.

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Data Availability Statement: The data from this study can be obtained upon reasonable request by the principal investigator, Elia J. Mmbaga (elia.mmbaga@medisin.uio.no).

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References

1. WHO. *Global Status Report on Alcohol and Health 2018*; WHO: Geneva, Switzerland, 2018.
2. Bloomfield, K. Understanding the alcohol-harm paradox: What next? *Lancet Public Health* **2020**, *5*, e300–e301. [CrossRef] [PubMed]
3. Li, Q.; Li, X.; Stanton, B. Alcohol use among female sex workers and male clients: An integrative review of global literature. *Alcohol Alcohol.* **2010**, *45*, 188–199. [CrossRef] [PubMed]
4. Lancaster, K.E.; Hetrick, A.; Jaquet, A.; Adedimeji, A.; Atwoli, L.; Colby, D.J.; Mayor, A.M.; Parcesepe, A.; Syvertsen, J. Substance use and universal access to HIV testing and treatment in sub-Saharan Africa: Implications and research priorities. *J. Virus Erad.* **2018**, *4* (Suppl. 2), 26–32. [CrossRef] [PubMed]
5. Roth, E.A.; Benoit, C.; Jansson, M.; Hallsgrimdottir, H. Public Drinking Venues as Risk Environments: Commercial Sex, Alcohol and Violence in a Large Informal Settlement in Nairobi, Kenya. *Hum. Ecol.* **2017**, *45*, 277–283. [CrossRef] [PubMed]
6. Roberts, E.; Ma, H.; Bhattacharjee, P.; Musyoki, H.K.; Gichangi, P.; Avery, L.; Musimbi, J.; Tsang, J.; Kaosa, S.; Kioko, J.; et al. Low program access despite high burden of sexual, structural, and reproductive health vulnerabilities among young women who sell sex in Mombasa, Kenya. *BMC Public Health* **2020**, *20*, 806. [CrossRef]
7. Leddy, A.M.; Underwood, C.; Decker, M.R.; Mbwambo, J.; Likindikoki, S.; Galai, N.; Kerrigan, D. Adapting the Risk Environment Framework to Understand Substance Use, Gender-Based Violence, and HIV Risk Behaviors Among Female Sex Workers in Tanzania. *AIDS Behav.* **2018**, *22*, 3296–3306. [CrossRef]
8. Malama, K.; Sagaon-Teyssier, L.; Parker, R.; Tichacek, A.; Sharkey, T.; Kilembe, W.; Inambao, M.; Price, M.A.; Spire, B.; Allen, S. Factors associated with alcohol use before sex among HIV-negative female sex workers in Zambia. *Int. J. STD AIDS* **2020**, *31*, 119–126. [CrossRef] [PubMed]
9. Amogne, M.D.; Agardh, A.; Abate, E.; Ahmed, J.; Asamoah, B.O. Determinants and consequences of heavy episodic drinking among female sex workers in Ethiopia: A respondent-driven sampling study. *PLoS ONE* **2021**, *16*, e0252432. [CrossRef]
10. Kibuuka, H.N.; Rono, K.; Maganga, L.; Millard, M.; Sekiziyivu, A.; Maboko, L.; Shaffer, D.; Valenzuela, A.; Michael, N.; Robb, M. Pattern of HIV risk behavior in a cohort of high risk women in East Africa. *Retrovirology* **2012**, *9* (Suppl. 2), 124. [CrossRef]
11. Vu, L.; Tun, W.; Apicella, L.; Casalini, C.; Makyao, N.; Tsang, S.; Michael, D.; Koppenhaver, T.; Mlanga, E. Community-based antiretroviral therapy (ART) delivery for female sex workers in Tanzania: Intervention model and baseline findings. *AIDS Care* **2019**, *32*, 729–734. [CrossRef]
12. Mmbaga, E.J.; Makayo, N.; Leshabari, M.T.; Leyna, G.H.; Karonda, P.; Ndayongeje, J.; Welty, S.; Said, C.; Mboya, I. *Integrated Bio-Behavioural Survey among Female Sex Workers in Dar Es Salaam, 2017*; National Aids Control Programme, Minstry of Health, Community Developement, Gender, Elders and Children: Dar es Salaam, Tanzania, 2018; p. 72.
13. Pithey, A.; Parry, C. Descriptive systematic review of Sub-Saharan African studies on the association between alcohol use and HIV infection. *SAHARA J.* **2009**, *6*, 155–169. [CrossRef] [PubMed]
14. Kalichman, S.C.; Simbayi, L.C.; Kaufman, M.; Cain, D.; Jooste, S. Alcohol use and sexual risks for HIV/AIDS in sub-Saharan Africa: Systematic review of empirical findings. *Prev. Sci.* **2007**, *8*, 141–151. [CrossRef] [PubMed]
15. Shuper, P.A.; Neuman, M.; Kanteres, F.; Baliunas, D.; Joharchi, N.; Rehm, J. Causal Considerations on Alcohol and HIV/AIDS—A Systematic Review. *Alcohol Alcohol.* **2010**, *45*, 159–166. [CrossRef] [PubMed]
16. Rehm, J.; Probst, C.; Shield, K.D.; Shuper, P.A. Does alcohol use have a causal effect on HIV incidence and disease progression? A review of the literature and a modeling strategy for quantifying the effect. *Popul. Health Metr.* **2017**, *15*, 4. [CrossRef] [PubMed]
17. Chersich, M.F.; Bosire, W.; King'ola, N.; Temmerman, M.; Luchters, S. Effects of hazardous and harmful alcohol use on HIV incidence and sexual behaviour: A cohort study of Kenyan female sex workers. *Glob. Health* **2014**, *10*, 22. [CrossRef] [PubMed]
18. Scott-Sheldon, L.A.; Carey, K.B.; Cunningham, K.; Johnson, B.T.; Carey, M.P. Alcohol Use Predicts Sexual Decision-Making: A Systematic Review and Meta-Analysis of the Experimental Literature. *AIDS Behav.* **2016**, *20* (Suppl. 1), 19–39. [CrossRef]
19. George, W.H.; Blayney, J.A.; Stappenbeck, C.A.; Davis, K.C. The Role of Alcohol-Related Behavioral Risk in the Design of HIV Prevention Interventions in the Era of Antiretrovirals: Alcohol Challenge Studies and Research Agenda. *AIDS Behav.* **2021**, *25*, 347–364. [CrossRef]
20. Berry, M.S.; Johnson, M.W. Does being drunk or high cause HIV sexual risk behavior? A systematic review of drug administration studies. *Pharmacol. Biochem. Behav.* **2018**, *164*, 125–138. [CrossRef]
21. George, W.H. Alcohol and Sexual Health Behavior: "What We Know and How We Know It". *J. Sex Res.* **2019**, *56*, 409–424. [CrossRef]
22. Grodensky, C.A.; Golin, C.E.; Ochtera, R.D.; Turner, B.J. Systematic review: Effect of alcohol intake on adherence to outpatient medication regimens for chronic diseases. *J. Stud. Alcohol Drugs* **2012**, *73*, 899–910. [CrossRef]
23. Jooste, S.; Mabaso, M.; Taylor, M.; North, A.; Shean, Y.; Simbayi, L.C. Socio-economic differences in the uptake of HIV testing and associated factors in South Africa. *BMC Public Health* **2021**, *21*, 1591. [CrossRef]
24. Fearon, E.; Phillips, A.; Mtetwa, S.; Chabata, S.T.; Mushati, P.; Cambiano, V.; Busza, J.; Napierala, S.; Hensen, B.; Baral, S.; et al. How Can Programs Better Support Female Sex Workers to Avoid HIV Infection in Zimbabwe? A Prevention Cascade Analysis. *J. Acquir. Immune Defic. Syndr.* **2019**, *81*, 24–35. [CrossRef]

25. Kaufman, M.R.; Cornish, F.; Zimmerman, R.S.; Johnson, B.T. Health behavior change models for HIV prevention and AIDS care: Practical recommendations for a multi-level approach. *J. Acquir. Immune Defic. Syndr.* **2014**, *66* (Suppl. 3), 250–258. [CrossRef]
26. Shannon, K.; Goldenberg, S.M.; Deering, K.N.; Strathdee, S.A. HIV infection among female sex workers in concentrated and high prevalence epidemics: Why a structural determinants framework is needed. *Curr. Opin. HIV AIDS* **2014**, *9*, 174. [CrossRef]
27. Parcesepe, A.M.; L'engle, K.L.; Martin, S.L.; Green, S.; Sinkele, W.; Suchindran, C.; Speizer, I.S.; Mwarogo, P.; Kingola, N. The impact of an alcohol harm reduction intervention on interpersonal violence and engagement in sex work among female sex workers in Mombasa, Kenya: Results from a randomized controlled trial. *Drug Alcohol Depend.* **2016**, *161*, 21–28. [CrossRef]
28. Chersich, M.F.; Luchters, S.M.F.; Malonza, I.M.; Mwarogo, P.; King'ola, N.; Temmerman, M. Heavy episodic drinking among Kenyan female sex workers is associated with unsafe sex, sexual violence and sexually transmitted infections. *Int. J. STD AIDS* **2007**, *18*, 764–769. [CrossRef]
29. WHO. *Alcohol Consumption and Sustainable Development: Fact sheet on Sustainable Development Goals (SDGs): Health Targets*; WHO Regional Office for Europe: Copenhagen, Denmark, 2020.
30. WHO. *Global Strategy to Reduce the Harmful Use of Alcohol*; WHO: Geneva, Switzerland, 2010.
31. Babor, F.; Biddle-Higgins, J.C.; Saunders, J.B.; Monteiro, M.G. *The Alcohol Use Disorders Identification Test (AUDIT): Guidelines for Use in Primary Care*, 2nd ed.; The World Health Organization: Geneva, Switzerland, 2001.
32. Tanzania National Bureau of Statistics. *2022 Population and Housing Census—Preliminary Report in Swahili Language*; Tanzania National Bureau of Statistic: Dodoma, Tanzania, 2022.
33. TACAIDS; ZAC. *Tanzania HIV Impact Survey (THIS) 2016-2017: Final Report*; Tanzania Commission for AIDS (TACAIDS); Zanzibar AIDS Commission (ZAC): Dar es Salaam, Tanzania, 2018.
34. Dutta, A.; Barker, C.; Makyao, N. *Consensus Estimates on Key Population Size and HIV Prevalence in Tanzania*; National AIDS Control Programme (NACP), Ministry of Health and Social Welfare: Dar es Salaam, Tanzania, 2014.
35. National AIDS Control Programme. *National Guidelines for Management of HIV and AIDS*; Ministry of Health, Community, Developement, Gender, Elderly and Children, National AIDS Control Programme: Dar es Salaam, Tanzania, 2019; p. 308.
36. Schonlau, M.; Liebau, E. Respondent-Driven Sampling. *Stata J.* **2012**, *12*, 72–93. [CrossRef]
37. Kerrigan, D.; Mbwambo, J.; Likindikoki, S.; Beckham, S.; Mwampashi, A.; Shembilu, C.; Mantsios, A.; Leddy, A.; Davis, W.; Galai, N. Project Shikamana: Baseline Findings From a Community Empowerment-Based Combination HIV Prevention Trial Among Female Sex Workers in Iringa, Tanzania. *J. Acquir. Immune Defic. Syndr.* **2017**, *74* (Suppl. 1), 60–68. [CrossRef] [PubMed]
38. University of Oslo. *Nettskjema*; University of Oslo: Oslo, Norway, 2022.
39. TSD Service Group. *Services for Sensitive Data (TSD)*; IT Department, University of Oslo: Oslo, Norway, 2022.
40. Kroenke, K.; Spitzer, R.L.; Williams, J.B. The Patient Health Questionnaire-2: Validity of a two-item depression screener. *Med. Care* **2003**, *41*, 1284–1292. [CrossRef] [PubMed]
41. Kroenke, K.; Spitzer, R.L.; Williams, J.B.; Monahan, P.O.; Löwe, B. Anxiety disorders in primary care: Prevalence, impairment, comorbidity, and detection. *Ann. Intern Med.* **2007**, *146*, 317–325. [CrossRef] [PubMed]
42. Broadhead, W.E.; Gehlbach, S.H.; De Gruy, F.V.; Kaplan, B.H. The Duke–UNC Functional Social Support Questionnaire: Measurement of Social Support in Family Medicine Patients. *Med. Care* **1988**, *26*, 709–723. [CrossRef]
43. Klein, H.; Washington, T.A. The Pre-Exposure Prophylaxis (PrEP) Stigma Scale: Preliminary findings from a pilot study. *Int. Public Health J.* **2019**, *11*, 185–195.
44. Vissoci, J.R.N.; Hertz, J.; El-Gabri, D.; Andrade Do Nascimento, J.R.; Pestillo De Oliveira, L.; Mmbaga, B.T.; Mvungi, M.; Staton, C.A. Cross-cultural adaptation and psychometric properties of the audit and cage questionnaires in Tanzanian Swahili for a traumatic brain injury population. *Alcohol Alcohol.* **2018**, *53*, 112–120. [CrossRef]
45. Babor, T.F.; Robaina, K. The Alcohol Use Disorders Identification Test (AUDIT): A review of graded severity algorithms and national adaptations. *Int. J. Alcohol Drug Res.* **2016**, *5*, 17–24. [CrossRef]
46. Berger, B.E.; Ferrans, C.E.; Lashley, F.R. Measuring stigma in people with HIV: Psychometric assessment of the HIV stigma scale. *Res. Nurs. Health* **2001**, *24*, 518–529. [CrossRef]
47. Epino, H.M.; Rich, M.L.; Kaigamba, F.; Hakizamungu, M.; Socci, A.R.; Bagiruwigize, E.; Franke, M.F. Reliability and construct validity of three health-related self-report scales in HIV-positive adults in rural Rwanda. *AIDS Care* **2012**, *24*, 1576–1583. [CrossRef]
48. Westreich, D.; Greenland, S. The table 2 fallacy: Presenting and interpreting confounder and modifier coefficients. *Am. J. Epidemiol.* **2013**, *177*, 292–298. [CrossRef]
49. Textor, J.; Hardt, J.; Knüppel, S. DAGitty: A Graphical Tool for Analyzing Causal Diagrams. *Epidemiology* **2011**, *22*, 745. [CrossRef]
50. Muller, C.J.; MacLehose, R.F. Estimating predicted probabilities from logistic regression: Different methods correspond to different target populations. *Int. J. Epidemiol.* **2014**, *43*, 962–970. [CrossRef]
51. Sperandei, S.; Bastos, L.S.; Ribeiro-Alves, M.; Reis, A.; Bastos, F.I. Assessing logistic regression applied to respondent-driven sampling studies: A simulation study with an application to empirical data. *Int. J. Soc. Res. Methodol.* **2022**, 1–15. [CrossRef]
52. Avery, L.; Rotondi, N.; McKnight, C.; Firestone, M.; Smylie, J.; Rotondi, M. Unweighted regression models perform better than weighted regression techniques for respondent-driven sampling data: Results from a simulation study. *BMC Med. Res. Methodol.* **2019**, *19*, 1–13. [CrossRef] [PubMed]
53. de Meneses-Gaya, C.; Zuardi, A.W.; Loureiro, S.R.; Crippa, J.A.S. Alcohol Use Disorders Identification Test (AUDIT): An updated systematic review of psychometric properties. *Psychol. Neurosci.* **2009**, *2*, 83–97. [CrossRef]

54. Lancaster, K.E.; MacLean, S.A.; Lungu, T.; Mmodzi, P.; Hosseinipour, M.C.; Hershow, R.B.; Powers, K.A.; Pence, B.W.; Hoffman, I.F.; Miller, W.C.; et al. Socioecological Factors Related to Hazardous Alcohol use among Female Sex Workers in Lilongwe, Malawi: A Mixed Methods Study. *Subst. Use Misuse* **2018**, *53*, 782–791. [CrossRef] [PubMed]
55. Weiss, H.A.; Vandepitte, J.; Bukenya, J.N.; Mayanja, Y.; Nakubulwa, S.; Kamali, A.; Seeley, J.; Grosskurth, H. High Levels of Persistent Problem Drinking in Women at High Risk for HIV in Kampala, Uganda: A Prospective Cohort Study. *Int. J. Environ. Res. Public Health* **2016**, *13*, 153. [CrossRef] [PubMed]
56. Deering, K.N.; Amin, A.; Shoveller, J.; Nesbitt, A.; Garcia-Moreno, C.; Duff, P.; Argento, E.; Shannon, K. A Systematic Review of the Correlates of Violence Against Sex Workers. *Am. J. Public Health* **2014**, *104*, e42–e54. [CrossRef] [PubMed]
57. Mirzadeh, M.; Olfatifar, M.; Eslahi, A.V.; Abdoli, A.; Houshmand, E.; Majidiani, H.; Johkool, M.G.; Askari, S.; Hashemipour, S.; Badri, M. Global prevalence of Trichomonas vaginalis among female sex workers: A systematic review and meta-analysis. *Parasitol. Res.* **2021**, *120*, 2311–2322. [CrossRef]
58. Beattie, T.S.; Smilenova, B.; Krishnaratne, S.; Mazzuca, A. Mental health problems among female sex workers in low- and middle-income countries: A systematic review and meta-analysis. *PLoS Med.* **2020**, *17*, e1003297. [CrossRef]
59. WHO Alcohol—Fact Sheet. Available online: https://www.who.int/news-room/fact-sheets/detail/alcohol (accessed on 4 June 2022).
60. Meier, P.S.; Warde, A.; Holmes, J. All drinking is not equal: How a social practice theory lens could enhance public health research on alcohol and other health behaviours. *Addiction* **2018**, *113*, 206–213. [CrossRef]
61. Bacchus, L.J.; Ranganathan, M.; Watts, C.; Devries, K. Recent intimate partner violence against women and health: A systematic review and meta-analysis of cohort studies. *BMJ Open* **2018**, *8*, e019995. [CrossRef]
62. Wilson, K.S.; Deya, R.; Masese, L.; Simoni, J.M.; Stoep, A.V.; Shafi, J.; Jaoko, W.; Hughes, J.P.; McClelland, R.S. Prevalence and correlates of intimate partner violence in HIV-positive women engaged in transactional sex in Mombasa, Kenya. *Int. J. STD AIDS* **2015**, *27*, 1194–1203. [CrossRef]
63. Miller, A.P.; Pitpitan, E.V.; Nabukalu, D.; Nalugoda, F.; Nakigozi, G.; Kigozi, G.; Grabowski, M.K.; Kennedy, C.E.; Wagman, J.A. Transactional Sex, Alcohol Use and Intimate Partner Violence Against Women in the Rakai Region of Uganda. *AIDS Behav.* **2021**, *25*, 1144–1158. [CrossRef]
64. Leddy, A.M.; Kerrigan, D.; Kennedy, C.E.; Mbwambo, J.; Likindikoki, S.; Underwood, C.R. 'You already drank my beer, I can decide anything': Using structuration theory to explore the dynamics of alcohol use, gender-based violence and HIV risk among female sex workers in Tanzania. *Cult. Health Sex.* **2018**, *20*, 1409–1423. [CrossRef]
65. WHO. *Violence against Women: Intimate Partner and Sexual Violence against Women: Intimate Partner and Sexual Violence Have Serious Short-and Long-Term Physical, Mental and Sexual and Reproductive Health Problems for Survivors: Fact Sheet*; WHO: Geneva, Switzerland, 2014.
66. Gibbs, A.; Chirwa, E.; Dunkle, K. A Prospective Analysis of the Interrelationship between Physical Intimate Partner Violence and Alcohol Use: A Post-Hoc Analysis of Young Women Involved in the Stepping Stones and Creating Futures Trial in South Africa. *J. Interpers. Violence* **2022**, *38*, NP750–NP771. [CrossRef]
67. Fernandes, A.D. How far up the river? Criminal justice contact and health outcomes. *Soc. Curr.* **2020**, *7*, 29–45. [CrossRef]
68. Sugie, N.F.; Turney, K. Beyond Incarceration: Criminal Justice Contact and Mental Health. *Am. Sociol. Rev.* **2017**, *82*, 719–743. [CrossRef]
69. Shannon, K.; Strathdee, S.A.; Goldenberg, S.M.; Duff, P.; Mwangi, P.; Rusakova, M.; Reza-Paul, S.; Lau, J.; Deering, K.; Pickles, M.R.; et al. Global epidemiology of HIV among female sex workers: Influence of structural determinants. *Lancet* **2015**, *385*, 55–71. [CrossRef]
70. Hendrickson, Z.M.; Leddy, A.M.; Galai, N.; Beckham, S.W.; Davis, W.; Mbwambo, J.K.; Likindikoki, S.; Kerrigan, D.L. Mobility for sex work and recent experiences of gender-based violence among female sex workers in Iringa, Tanzania: A longitudinal analysis. *PLoS ONE* **2021**, *16*, e0252728. [CrossRef]
71. Hendrickson, Z.M.; Leddy, A.M.; Galai, N.; Mbwambo, J.K.; Likindikoki, S.; Kerrigan, D.L. Work-related mobility and experiences of gender-based violence among female sex workers in Iringa, Tanzania: A crosssectional analysis of baseline data from Project Shikamana. *BMJ Open* **2018**, *8*, e022621. [CrossRef]
72. Saggurti, N.; Jain, A.K.; Sebastian, M.P.; Singh, R.; Modugu, H.R.; Halli, S.S.; Verma, R.K. Indicators of Mobility, Socio-Economic Vulnerabilities and HIV Risk Behaviours Among Mobile Female Sex Workers in India. *AIDS Behav.* **2012**, *16*, 952–959. [CrossRef]
73. Carrasco, M.A.; Esser, M.B.; Sparks, A.; Kaufman, M.R. HIV-Alcohol Risk Reduction Interventions in Sub-Saharan Africa: A Systematic Review of the Literature and Recommendations for a Way Forward. *AIDS Behav.* **2016**, *20*, 484–503. [CrossRef]
74. Kerrigan, D.; Donastorg, Y.; Barrington, C.; Perez, M.; Gomez, H.; Mbwambo, J.; Likindikoki, S.; Mantsios, A.; Beckham, S.W.; Leddy, A.; et al. Assessing and Addressing Social Determinants of HIV among Female Sex Workers in the Dominican Republic and Tanzania through Community Empowerment-Based Responses. *Curr. HIV/AIDS Rep.* **2020**, *17*, 88–96. [CrossRef] [PubMed]

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Early disengagement from HIV pre-exposure prophylaxis services and associated factors among female sex workers in Dar es Salaam, Tanzania: a socioecological approach

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ABSTRACT

Introduction Pre-exposure prophylaxis (PrEP) is an effective HIV prevention tool when taken as prescribed. However, suboptimal use may challenge its real-life impact. To support female sex workers in their efforts to prevent themselves from HIV, it is essential to identify factors that contribute to early disengagement from PrEP care. In this study, we aimed to estimate the risk of early disengagement from PrEP services among female sex workers in Tanzania and associated factors using a socioecological model as a guiding framework.

Methods The study was conducted as part of a pragmatic mHealth trial for PrEP roll-out in Dar es Salaam in 2021. We estimated the risk of early disengagement, defined as not presenting for the first follow-up visit (within 56 days of enrolment), and its associations with individual, social, behavioural and structural factors (age, self-perceived HIV risk, mental distress, harmful alcohol use, condom use, number of sex work clients, female sex worker stigma and mobility) using multivariable logistic regression models, with marginal standardisation to obtain adjusted relative risks (aRR).

Results Of the 470 female sex workers enrolled in the study, 340 (74.6%) did not attend the first follow-up visit (disengaged). Mental distress (aRR=1.14; 95% CI 1.01 to 1.27) was associated with increased risk of disengagement. Participants who reported a higher number of clients per month (10–29 partners: aRR=0.87; 95% CI 0.76 to 0.98 and ≥30 partners: aRR=0.80; 95% CI 0.68 to 0.91) and older participants (≥35 years) (RR=0.75; 95% CI 0.56 to 0.95) had a lower risk of disengagement.

Conclusions and recommendations Early disengagement with the PrEP programme was high. Mental distress, younger age and having fewer clients were risk factors for disengagement. We argue that PrEP programmes could benefit from including mental health screening and treatment, as well as directing attention to younger sex workers and those reporting fewer clients.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Oral pre-exposure prophylaxis (PrEP) in an effective HIV preventive drug for key populations at increased risk of HIV, but studies have shown suboptimal use and engagement with PrEP services, challenging its 'real life' impact.

⇒ There is limited evidence from epidemiological studies on factors influencing engagement with services among female sex workers in sub-Saharan Africa

WHAT THIS STUDY ADDS

⇒ Using a socioecological model to guide investigation, this study found that younger age, mental distress and having few sex work clients were associated with early disengagement

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The study highlights the need for integrated programmes for key populations that addresses more than one disease or social circumstance at a time, such as integrated mental health and HIV services and tailored interventions for younger female sex workers.

INTRODUCTION

Female sex workers are one of the so-called key populations in the HIV epidemic and are 30 times more likely than other adult women to contract HIV.[1] Their vulnerability to HIV is shaped by a complex interplay of individual, social, behavioural and structural factors, including, but not limited to, unprotected sex, multiple sexual partnerships, stigma, gender-based violence (GBV) and legislation that unfavourably impacts sex work.[2] Approaches that have been effective in reducing HIV risk among female sex workers include behaviour change communication, harm reduction services, peer-led programmes, as well as

initiatives and strategies focused on solidarity and empowerment.[3] Over the last decade, oral pre-exposure prophylaxis (PrEP), antiretroviral (ARV) medication taken as a daily pill, was found to be efficient in preventing HIV acquisition.[4] Following this, in 2015 WHO recommended the use of PrEP as a complementary prevention approach for populations at high risk of HIV infection. Many countries, including Tanzania, have later incorporated oral PrEP into their HIV prevention programmes.

Even though trials have demonstrated PrEP's efficiency, several studies have identified implementation challenges along the PrEP care continuum[5–12] that may challenge its anticipated impact. The 'care continuum' or 'prevention cascade' typically includes aspects such as awareness and/or knowledge, motivation, uptake, adherence, engagement and continuation in programmes and even measurements of restarting after stopping use.[13 14] A recent systematic review including several population groups globally found high discontinuation rates, defined as loss to follow-up or self-reported PrEP stoppage, with an overall pooled prevalence of 41% (48% in sub-Saharan Africa) within the first 6 months of PrEP initiation. Factors that were most commonly reported to be associated with discontinuation were young age, being female and being transgender. Only three of the 56 included studies were conducted among female sex workers, among whom the pooled prevalence was higher at 50% (25.7–75.4%).[15] Hendrickson *et al* proposed that one of the success criteria of a PrEP programme is that the client either remains engaged in care (presents to follow-up) or has discontinued PrEP in consultation with a healthcare provider.[16] This enables the provider to conduct risk assessments of individual users, discuss other prevention options with them if they wish to discontinue PrEP and to detect any cases of seroconversion during PrEP use. We argue that attending the first follow-up visit is particularly important as the need for more information relating to side effects and correct use is expected to be highest early on. Additionally, the indication for PrEP use is less likely to have changed within such a short time frame.[14]

Tanzania is implementing daily oral PrEP programming in several regions, including in the country's largest city Dar es Salaam, where approximately 15% of female sex workers are estimated to be living with HIV.[17] Studies from Tanzania have found that willingness to use PrEP is high among female sex workers and female bar workers, where members of the latter occupational group are known to commonly exchange sex for money.[18 19] However, the first demonstration trial in the country conducted among female sex workers and other key population groups revealed that less than half of those starting PrEP attended the first follow-up visit,[20] highlighting the need for investigation into factors that might influence disengagement from PrEP care.

Socioecological frameworks can aid in this understanding. These frameworks[21] exist in slightly different forms, but have in common that they aim to encompass the numerous factors that can have impact on risk of disease or that can influence health behaviour from the micro (individual) level to the macro (or structural) level. Drawing on such frameworks offers the advantage of preventing overly simplistic assumptions. For instance, it ensures that disengagement from PrEP services is not merely viewed as an individual behaviour, but a practice influenced by a complex interplay of individual, behavioural, social and structural factors. Specific frameworks to aid in the understanding of HIV risk and HIV-related behaviour using a socioecological approach have previously been proposed.[22–24] In this study, we study the association between early disengagement from a PrEP programme, defined as not attending the first scheduled follow-up visit, and eight factors that have been previously shown to be associated with HIV or the PrEP continuum in various population groups. That said, it is noteworthy that knowledge from quantitative studies on factors concerning PrEP use among female sex workers is scarce. The factors explored in this study are situated in different layers of the socioecological model, although several factors can be seen as belonging to more than one layer. At the individual level, studies have shown that older *age* at PrEP initiation can predict continuation among female sex workers,[25 26] while high *self-perceived HIV risk* has been linked to PrEP uptake and continuation.[27] Often referred to as psychosocial factors, *poor mental health* and *alcohol use* have been linked to adherence to or continuation with PrEP.[25 26] On the interpersonal/network level, we explore if sexual and/or prevention practices such as *condom use* and *number of sex work clients* are factors that influence disengagement with PrEP services. On the community level, the hypothesis is that *stigma related to sex work* influences disengagement from PrEP, as stigma can negatively affect health service use.[28] Finally, we investigate if *mobility for sex work*, sometimes viewed as a sociostructural factor, increases the risk of disengagement, as this link has been suggested in a recent study.[29]

This study seeks to narrow the evidence gap on factors associated with disengagement in PrEP programmes among female sex workers in one of the first PrEP programmes in Tanzania, with the ultimate aim of informing PrEP programming locally and regionally.

METHODS

Study design and setting

This paper presents an analysis of a cohort of female sex workers from an intervention site of a pragmatic mobile health (mHealth) PrEP study conducted in the city of Dar es Salaam, Tanzania.[30 31] Dar es Salaam is the financial capital of Tanzania, with a prevalence of HIV among female sex workers among the highest in the country.[32] The study was conducted in collaboration with a local sex worker-friendly satellite clinic, set up within a gated compound in a central part of the city. During participants' first visit they were prescribed PrEP and received the study intervention, an mHealth app called '*Jichunge*' ('protect yourself') to promote adherence to medication

and follow-up visits. This included onboarding and instructions about app features, such as an alarm to remind the participants of pill taking, gamification aspects and the opportunity to contact staff in case of any questions. The clinic was open Mondays to Fridays, and some Saturdays, from morning to afternoon and was highly flexible when it comes to accommodating participants' schedules including catering for drop-in. For the subanalysis presented in this paper, a single proportion formula with 50% used as proportion of disengagement and a 5% margin of error would require a minimum sample size of 385. The total sample size of the mother study, 470, was therefore sufficient to estimate the outcome.[30]

Study participants

Female sex workers were defined as women who reported to have sold sex for money or goods in the last 3 months before study recruitment. Eligibility criteria were being 18 years or older, having lived in the city of Dar es Salaam for at least 6 months preceding the survey, owning a smartphone, ability to give informed consent and being eligible for and interested in starting PrEP. Participants were recruited between March and July 2021 using respondent-driven sampling (RDS). RDS is a method commonly used when a sampling frame is not available.[33] The method can be considered a modified 'snowballing' sampling strategy combined with a mathematical model that weights the sample to mitigate the biases associated with oversampling or undersampling certain groups. We identified three initial female sex workers ('seeds') to start the recruitment process and added more seeds as the recruitment progressed. They were given three coupons each and asked to recruit others from the study population using these coupons as study invitation. In the selection of the 'seeds', we sought a variation of sociodemographic and sex work characteristics, such as diversity in age, socioeconomic status, residential neighbourhood and type of sex work (ie, where they got in touch with clients). Most of the seeds were good recruiters, while one of the seeds did not recruit, and we were informed later that another seed might not have distributed the coupons herself. Although aiming for a diversity in type of sex work, most of the recruited participants reported to work from bars. Implementation challenges are common in RDS studies.[33] We sought to mitigate these by including more seeds with varying characteristic, recommended if recruitment chains die out or recruitment is too slow.[34] The final number of seeds was 9. We also learnt through qualitative accounts that some of the women who got in touch with clients through internet/phone, street or brothels also sometimes worked from bars (bars could, for instance, be located adjacent to brothels), which indicated that the 'type of sex work' category was more fluid in our context. The recruitment procedure was repeated with new recruits yielding new waves of participants and continued until we reached the desired sample size. In line with RDS,[34] the women received a reimbursement for participation (8000 Tanzanian shillings≈US$3.5) and for recruiting new participants (4000 Tanzanian shillings≈US$1.75). Participants were screened for eligibility by study staff, including peer educators. The participants were assessed for PrEP eligibility by the local clinic using standard national criteria: being HIV negative and at substantial risk of HIV infection with no suspicion of acute HIV infection, serum creatinine clearance >60 mL/min and being willing to consent to and use PrEP as prescribed.[35] Eligible participants were prescribed PrEP at enrolment, and follow-up was scheduled as monthly visits. The clinic provided PrEP to all those who were eligible regardless of mobile phone ownership, which was only a criterion for study recruitment/enrolment.

Participant and public involvement

The research group has a long-standing collaboration with peer educators from key populations in Tanzania. These were integral in the research assistant team and assisted in the development of the mother study intervention (the mHealth app), the recruitment (identified 'seeds') and data collection.

Data collection procedures

Trained research assistants administered a questionnaire through face-to-face interviews at enrolment. Data on motivation for PrEP use (eg, self-perceived HIV risk), sex work history and practices, as well as sociodemographic characteristics and socioenvironmental factors (eg, mobility, stigma, substance use) and questions related to mHealth, were collected. The interview lasted for about an hour and was conducted in the national language, Swahili, by Swahili-speaking staff. Participants were registered when they came for their first follow-up appointment. Participants' responses during interviews were directly plotted into a web-based questionnaire solution ('Nettskjema') and submitted into a highly secure platform: Services for Sensitive Data developed and operated by the University of Oslo.[36]

Outcome variable

Disengagement from care was the outcome variable, defined as no evidence of having attended the first scheduled follow-up appointment in the PrEP programme. The follow-up appointment was typically scheduled 28 days after the enrolment visit. In the operationalisation of the outcome variable, we included an additional 28 days to allow for delay, in line with other studies in the field before declared as a missed appointment.[9 25]

Exposure variables

Exposure variables were age, self-perceived HIV risk, mental distress, harmful alcohol use, condom use, number of sex work clients, female sex worker stigma and mobility for sex work. Mental distress was defined as a positive screen for depression using the Patient Health Questionnaire 2 (PHQ-2)[37] and/or a positive screen for anxiety disorder using the 2-item questionnaire Generalized Anxiety Disorder (GAD-2).[38] PHQ-2

asks about the frequency of depressed mood and lack of joy, while GAD-2 inquires about frequency of anxiety symptoms, both during the last 2 weeks. The four answer options range from not at all (0 point) to nearly every day (3 points). We used the standard cut-off of 3 for both screening tools. Harmful alcohol use was assessed with the WHO Alcohol Use Disorder Identification Test.[39] We used a Swahili version previously validated among patients with traumatic brain injury in Tanzania[40] with minor modifications in the wording. The 10-item instrument inquires about aspects of problematic alcohol use, including frequency and quantity of alcohol intake, harmful consequences of alcohol use and dependency. The maximum score is 40, and a cut-off of 16 is typically used to indicate a harmful pattern of use (or likely dependency). Sexual practices and previous prevention use were assessed by asking 'Did you use a condom the last time you had vaginal sex with a client?' and 'In the past one month: how many clients did you have vaginal sexual intercourse with?'. Stigma was assessed using a female sex worker stigma scale, previously used in Tanzania and the Dominican Republic[41] with a reliability coefficient of 0.88. We dichotomised the scale at the median. Mobility was assessed by the question: 'Within the last 6 months have you travelled to another city or county to perform sex work?'. Self-perceived HIV risk was categorised into 'high', 'medium/low/no' and 'don't know'.

Confounders

In addition to the exposure outlined above, several factors were considered potential confounders for each exposure-outcome pair (online supplemental file 1). Education level was categorised as primary (or lower) or secondary (or higher); income from sex work was divided into four categories based on participants' estimations of income. Social support was measured using the Duke-UNC Functional Social Support Questionnaire[42] and had a reliability coefficient of 0.88. GBV was measured by two questions: 'Have you experienced physical violence (like being beaten) during the last 12 months?' and 'Have you been forced to have sex during the last six months?'. Answering yes to either of these questions was considered a positive screen for GBV. As a recent study found that new entrants to sex work were less likely to take PrEP every day,[43] the number of years since the participant first sold sex (<5 or ≥5 years) was also included as a potential confounder.

Statistical analysis

As participants were recruited using RDS, those with larger networks have potential to be over-represented in the sample. We therefore weighted the data using individualised weights, proportional to the inverse of a respondent's network size.[33] Categorical variables were summarised by estimating proportions and presented by PrEP disengagement status. To further estimate the associations between exposure variables and the outcome, we first conducted unadjusted logistic regression. We then proceeded building multivariable logistic regression models, one model for each exposure-outcome pair, to obtain adjusted relative risk (aRR). To aid in selection of variables to adjust for in each model we drew directed acyclic graphs (DAG) using DAGitty.net[44] guided by prior research, theoretical and plausible assumptions about relationships between variables (online supplemental file 1). Age was decided a priori as a forced variable to be included together with the main exposure in all models. We further used a modelling strategy described by Greenland *et al*,[45] aiming to reduce the mean square error of the effect measure coefficient. To assess the total effect of age, no adjustment was necessary, thus only unadjusted estimates are presented. For all analyses for assessing associations, we used unweighted data based on the evidence that unweighted regression analysis is less prone to bias than weighted analysis of RDS data.[46 47] As the outcome was common, following the logistic regression, we used marginal standardisation to obtain relative risk (RR) instead of the OR.[48] All analyses were two tailed with a significance level of 5% and conducted in STATA/SE V.16.0 (StataCorp 2019).

Ethics

The Tanzania Commission for Science and Technology granted individual research permits to foreign investigators. Permission to work with the clinic was granted by the clinic authorities. All participants were informed about the study's aims and proceedings and provided written informed consent. The study addressed national research priorities and strengthened local research capacity with a team made up by majority Tanzanian nationals. More details concerning the research collaboration can be found in the 'Author Reflexivity Statement' (online supplemental file 2). The study followed the principles of the Declaration of Helsinki.

RESULTS

Of the 470 female sex workers enrolled into the study, 340 (74.6% weighted) disengaged from care at month 1 follow-up (figure 1). Table 1 shows the distribution of sociodemographic, behavioural and structural characteristics of the study participants by disengagement status.

Three-quarters (n=153) of female sex workers below 25 years did not attend month 1 follow-up versus 57.8% (n=26) of women who were 35 years or older. Among women who had sex with less than 10 clients per month, 82.3% (n=102) were disengaged from care at month 1; in contrast, among women with 30 or more clients, 63.0% (n=110) were disengaged. Of the women who scored positive for mental distress, 79.7% (n=114) did not attend month 1 follow-up, in contrast to 69.1% (n=224) of the women with a negative score (table 1).

In regression analysis (table 2), female sex workers with a positive screen for mental distress had a 14% increased risk of disengagement at month 1 follow-up compared with women who had a negative screen (aRR=1.14; 95%

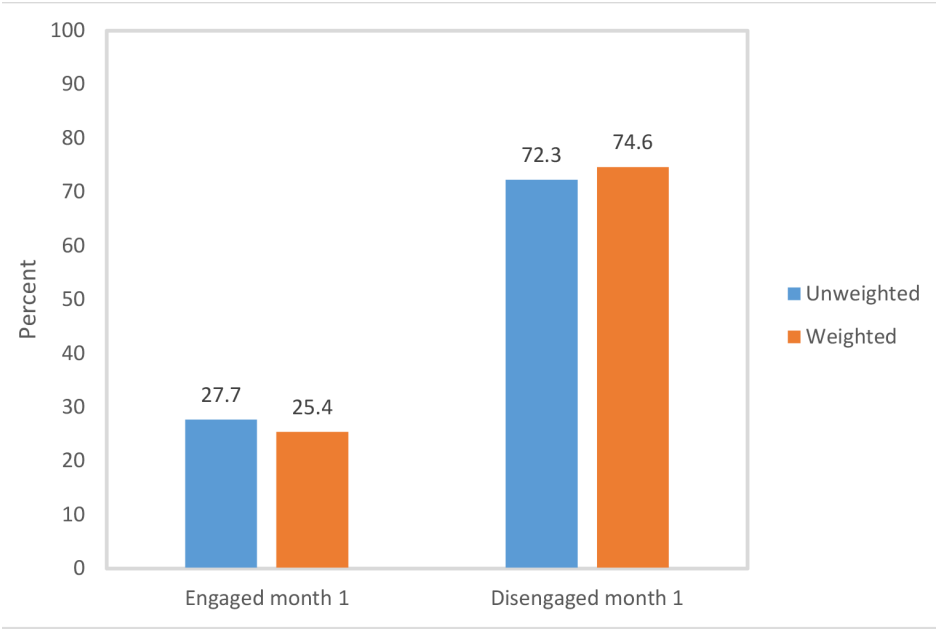

Figure 1 Early disengagement with PrEP services (month 1) among female sex workers in Dar es Salaam, Tanzania.

CI 1.01 to 1.27). Female sex workers reporting between 10 and 29 clients per month were 13% less likely to be disengaged compared with women with fewer than 10 clients/month (aRR=0.87; 95% CI 0.76 to 0.98), while women with 30 clients or more had 20% reduced risk of disengagement (aRR 0.80; 95% CI 0.68 to 0.91). The fewer the clients the women had, the higher the risk of disengagement: for example, in sensitivity analysis with even finer categories we found an RR=1.36 (95% CI 1.15 to 1.57) for those with zero to four clients compared with those ≥30, while those with five to seven clients had a comparable RR of 1.26 (95% CI 1.05 to 1.47). Age was also associated with early disengagement, with older age being significantly protective (RR=0.75; 95% CI 0.76 to 0.98). We found no statistically significant relationship between our outcome and the four other exposures in adjusted analysis: condom use (aRR=0.92; 95% CI 0.81 to 1.02), harmful alcohol use (aRR=1.02; 95% CI 0.90 to 1.13), female sex worker stigma (aRR=1.04; 95% CI 0.92 to 1.16) or mobility (aRR=0.91; 95% CI 0.80 to 1.01).

DISCUSSION

Early disengagement from care was high in this cohort with three-quarters (74.6%) of the female sex workers not attending the month 1 follow-up for PrEP refill and medical check-up. Disengagement was associated with younger age, mental distress and having fewer clients per month.

Like in our study, several PrEP programmes and studies among female sex workers in other sub-Saharan countries have also experienced high rates of disengagement from PrEP services. In the Treatment and Prevention for Female Sex Workers (TAPS) Demonstration Project conducted at two urban clinics in South Africa, 53% of the participants came for month 1 follow-up, while 22% were seen after 12 months.[7] Another demonstration study in Benin found that the overall retention at the end of the study was 47.3%,[29] while a study conducted at facilities for sex workers and men who have sex with men in South Africa showed that about 50% discontinued PrEP during the first 6 months.[27] In Kenya, 40.3%, 26.3% and 14% of the female sex workers were seen after 1, 3 and 6 months, respectively.[49] In contrast, a study from public health centres in Senegal saw high retention after 1 month (90%), 6 months (79.9%) and 12 months (73.4%), illustrating that achievement of high attendance to PrEP services among female sex workers is possible.[25] Our study found higher early disengagement in Tanzania than in any of the mentioned studies. One possible explanation for this could be that screening and enrolment were conducted at the same visit in our study, while in the TAPS and Benin studies, enrolment was done at a second visit, which could have meant that these participants were more motivated for PrEP care. We, however, note that self-perceived HIV risk was high in our cohort, thus an important aspect of PrEP motivation was indeed present.[50]

Reasons for disengagement from PrEP health programmes are usually multifactorial. In the studies cited in the previous paragraph, side effects and self-perceived HIV risk,[27] mobility among participants[29] and not using PrEP consistently[7] were some of the factors mentioned. Although a thorough review of possible reasons is outside the scope of this paper, some of the issues brought up by participants in our study were side effects, stigma related to PrEP use and other obligations, such as travels and work. It should also be noted that daily dosing for some was mentioned as an obstacle. Unfortunately, there is

Table 1 Distributions of baseline sociodemographic, behavioural and structural characteristics of female sex workers by early PrEP engagement status (N=470)

	Total (N=470) (weighted % of sample)	Engaged at month 1 follow-up (n=130)		Disengaged at month 1 follow-up (n=340)	
Characteristics	N (% weighted)	n	% (unweighted)	n	% (unweighted)
Age (years)					
18–24	199 (46.3)	46	23.1	153	76.9
25–34	226 (43.4)	65	28.8	161	71.2
≥35	45 (10.3)	19	42.2	26	57.8
Marital status					
Never married	361 (75.8)	93	25.8	268	74.2
Formerly married/ currently married/ cohabiting	109 (24.2)	37	33.9	72	66.1
Highest educational level					
Primary or lower	193 (46.7)	54	28.0	139	72.0
Secondary or above	277 (53.3)	76	27.4	201	72.6
Monthly income from sex work* (TZS†)					
<150 000	73 (19.1)	20	27.4	53	72.6
150 000–299 999	151 (28.6)	38	25.2	113	74.8
300 000–449 999	144 (32.8)	38	26.4	106	73.6
≥450 000	90 (19.5)	32	35.6	58	64.4
Number of clients/month (vaginal sex)					
<10	124 (33.9)	22	17.7	102	82.3
10–29	169 (35.5)	46	27.2	123	72.8
≥30	172 (30.5)	62	36.1	110	63.9
Condom use in last sex with client (vaginal sex)					
Yes	215 (49.3)	66	30.7	149	69.3
No	254 (50.7)	63	24.8	191	75.2
Female sex worker stigma score‡					
<30	205 (44.5)	66	32.2	139	67.8
≥30	252 (55.5)	60	23.8	192	76.2
Gender-based violence in last 12 months§					
Yes	241 (43.7)	71	29.5	170	70.5
No	227 (56.3)	58	25.6	169	74.5
Sex work-related mobility in last 6 months					
Yes	179 (28.4)	57	31.8	122	68.2
No	291 (71.6)	73	25.1	218	74.9
Harmful alcohol use					
Yes	230 (37.3)	65	28.3	165	71.7
No	240 (62.7)	65	27.1	175	72.9
Mental distress¶					
Yes	143 (32.2)	29	20.3	114	79.7

Continued

Table 1 Continued

	Total (N=470) (weighted % of sample)	Engaged at month 1 follow-up (n=130)		Disengaged at month 1 follow-up (n=340)	
No	324 (67.8)	100	30.9	224	69.1
Social support score**					
≤3	178 (40.0)	50	28.1	128	71.9
>3	289 (60.0)	78	27.0	211	73.0
Years since started sex work					
<5	215 (53.7)	51	23.7	164	76.3
≥5	255 (46.2)	79	31.0	176	69.0
Self-perceived HIV risk††					
High	334 (66.4)	95	28.4	239	71.6
Moderate/low/no	101 (23.6)	27	26.7	74	73.3
Don't know	33 (9.9)	7	21.2	26	78.8

*12 missing observations.
†US$1=TZS2300.
‡13 missing observations.
§Two missing observations.
¶Three missing observations.
**Three missing observations.
††Two missing observations.
PrEP, pre-exposure prophylaxis; TZS, Tanzanian shilling.

insufficient evidence for the effect of event-driven PrEP (PrEP taken before and after sexual risk) for women, and thus this is not a recommended dosing strategy for this group.[51] In the Senegalese study, older age was the only factor that was found to be associated with retention; the authors did not elaborate on what made this programme particularly successful. It is, however, noted that sex work is legal in Senegal and registered sex workers are obliged to attend mandatory health services. This programme included both registered and non-registered sex workers which might have had a positive impact on attendance.

Scholars have argued that public health narratives of HIV tend to leave out the importance of the social world in shaping healthy practices, and instead emphasise individual and biomedical interventions as the main solutions.[52] Our point of departure was to study disengagement from PrEP services, not mainly as an individual behaviour, but as a practice influenced by social and structural as well as individual and behavioural factors within a socioecological framework. One of these factors was mental distress. Previous studies have pointed to mental health as a central concern for an effective PrEP care continuum.[53 54] Mental health outcomes are typically situated at the individual level, but heavily influenced by social circumstances such as GBV, stigma and poverty, and often considered a sociopsychological factor. In this study, mental distress was defined as having symptoms of depression and/or anxiety. Of the participants, about a third screened positive for mental distress (n=143, 32.2%), and these had an 18% higher risk of PrEP discontinuation. Mental distress could have affected health-seeking behaviour through pathways such as avoiding social situations, experiencing less interest and engagement in things and feelings of anxiety.[54] Combining mental health services with HIV prevention and treatment could produce synergistic effects. In this way, PrEP care could serve as an entry point for promoting mental health, and vice versa.[53] In the Tanzanian PrEP implementation framework, mental health screening is briefly mentioned,[55] yet efforts could be made to expand this integration more fully by promoting holistic health services for sex workers that actively seek to address the complexity of their health needs by learning from earlier successful efforts in targeting this key population.[3] It is, however, important that screening and subsequent treatment of mental health conditions should not be made a prerequisite for access to PrEP, as PrEP ought to be easily available.[53]

The second factor associated with early disengagement was having a lower number of sex work partners, a social factor as it involves (at least) two people engaging in sexual contact. The finding could be related to lower HIV risk perception among sex workers with fewer sex clients which is in line with studies that have found that a higher degree of sexual risk can predict higher adherence to PrEP.[56] However, when we examined self-perceived HIV risk and disengagement, we did not find a significant association, pointing to other differences between those with higher and lower number of clients also being important. Another explanation could be fear of losing

Table 2 Unadjusted and adjusted logistic regression modelling with marginal standardisation, assessing associations between individual, social, behavioural and structural exposures and early PrEP disengagement among female sex workers (n=470)

	Unadjusted analysis		Adjusted analyses	
Exposures	**RR (95% CI)**	**P value**	**ARR (95% CI)**	**P value**
Age				
18–24	Ref			
25–34	0.93 (0.82 to 1.03)	0.187	NA	
≥35	0.75* (0.56 to 0.95)	0.010	NA	
Number of clients/month (vaginal sex)†				
<10	Ref			
10–29	0.88 (0.76 to 0.99)	0.059	0.87* (0.76 to 0.98)	0.048
≥30	0.78 (0.67 to 0.89)	0.001	0.80* (0.68 to 0.91)	0.003
Condom use in last vaginal sex with client‡				
No	Ref			
Yes	0.92 (0.82 to 1.03)	0.155	0.92 (0.81 to 1.02)	0.132
FSW stigma score§				
<30	Ref		Ref	
≥30	1.12 (0.99 to 1.26)	0.047	1.04 (0.92 to 1.16)	0.513
Mental distress¶				
No	Ref		Ref	
Yes	1.15 (1.03 to 1.28)	0.019	1.14* (1.01 to 1.27)	0.040
Mobility for sex work**				
No	Ref			
Yes	0.91 (0.80 to 1.02)	0.112	0.91 (0.80 to 1.01)	0.094
Harmful alcohol use††				
No	Ref			
Yes	0.98 (0.87 to 1.09)	0.775	1.02 (0.90 to 1.13)	0.740
Self-perceived HIV risk‡‡				
No/medium/low	Ref			
High	0.98 (0.84 to 1.11)	0.737	0.99 (0.85 to 1.12)	0.839
Don't know	1.08 (0.85 to 1.31)	0.528	1.03 (0.78 to 1.27)	0.832

*p-value < 0.05
†Adjusted for age, income and years since started sex work.
‡Adjusted for age, gender-based violence (GBV), FSW stigma and mental distress.
§Adjusted for age, income, number of clients and mobility.
¶Adjusted for age, income, number of clients, mobility and harmful alcohol use.
**Adjusted for age and social support.
††Adjusted for age, number of clients, social support and mobility.
‡‡Adjusted for age, education, number of clients, social support, GBV and mental distress.
ARR, adjusted relative risk; FSW, female sex worker; PrEP, pre-exposure prophylaxis; RR, relative risk.

clients and thus income due to PrEP use among those with fewer paying partners, as they might be more dependent on the earning from each single client. Indeed, in a study from Tanzania before PrEP was available, female sex workers expressed concerns about stigma from clients as PrEP could be mistaken for ARVs and thus indicate HIV positive status.[57] Work striving to limit public stigma related to both HIV and PrEP use continues to be particularly important. Additionally, services should be keen to discuss PrEP use with clients even in the context of relatively few sex work clients.

We also found that female sex workers aged between 18 and 25 years had an increased risk of early disengagement from PrEP services compared with those aged above 35. This finding corroborates earlier evidence that higher age predicts consistent PrEP use[25 26] and is likely related to factors ranging from the individual to the structural level (neurocognitive development, peer influence,

socioeconomic and structural vulnerabilities, etc).[58] Health services need to be particularly considerate when encountering young women who sell sex, ensuring that they experience friendly services and providers that are suitably trained on their needs. There would also seem to be a need for testing new innovative interventions tailored to this group. Additionally, as young women's vulnerability to HIV is related to social and structural inequities, actions on the social determinants of health, such as social and economic empowerment, and efforts to alter sexual norms and gender-related norms cannot be underestimated.

There are a few important limitations to this study. First, there is no consensus on how to best perform analysis of associations with RDS data, thus the findings should be interpreted with some caution. We have, however, followed recommendations using unweighted data based on studies in the field. Second, one of the eligibility criteria for study enrolment was smartphone ownership. This could have affected representativeness, as women who own a smartphone may differ from those who may not afford a smartphone. Third, as with many survey datasets, it is not straightforward to assert the direction of effect between exposures and confounder variables measured at baseline, as the temporality aspect is lacking. As this in turn guides adjustment selection, some caution is warranted when interpreting the estimates. However, directed by our DAG, we adjusted for potential confounders in each model, several of which the direction of effect is known, and typically identified as important in this population. Fourth, self-report measures are subject to the risks of desirability bias. We sought to mitigate this by training the research assistants in sensitive communication in relation to key populations, as well as including members of these groups in our team. Considering the relatively high proportions reported of what could be considered less socially acceptable behaviour (harmful alcohol use, specific sexual practices, etc), this might have been less of a problem in our study. Fifth, the study recruited participants from the intervention site who have been receiving reminder messages to attend clinics. There is potential that the intervention might have improved engagement with the PrEP programme, hence underestimating our estimated disengagement rate. However, given that the estimated disengagement is high, the intervention would not affect the conclusions presented in this paper. Finally, we chose to focus on a few specific individual, social, behavioural and structural factors in this study. There are likely other relevant factors that also affected the risk of disengagement, but these were outside the scope of this study.

CONCLUSION

Our study conducted among female sex workers in Dar es Salaam found high early disengagement with PrEP services, and this was associated with mental distress, younger age and having fewer clients. By situating and discussing these findings within a socioecological framework, we hope to have contributed to disengagement being recognised as a complex phenomenon that is shaped by elements within multiple nested layers and thus to an increased understanding of so-called non-compliance issues in HIV prevention. The study can further provide policy makers, health practitioners and PrEP users with valuable insights into how and where to best focus their efforts. Integrating mental health services with HIV prevention, increasing research focus on young sex workers, while ensuring that information regarding indication and need for PrEP are provided to all sex workers, regardless of client numbers, can be one way forward. Finally, we also call for qualitative research to further explore the sociocultural contexts and individual perspectives that may contribute to early disengagement.

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Contributors All authors conceptualised and designed the study. HOL analysed and interpreted the data, with inputs from all the authors. HOL was responsible for the write-up with the assistance of EJM. KM, CHM and MRK reviewed the work critically for its content, and all authors have approved the final version including being accountable for all aspects of the work. EJM is responsible for the overall content as the guarantor.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Obtained.

Ethics approval This study involves human participants and was approved by the Ethical Review Committee of the Muhimbili University of Health and Allied Sciences (MUHAS), the Tanzania National Health Research Ethics Committee (NatREC) and the Regional Committee for Medical and Health Research Ethics (REK) in Norway. Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. The data can be obtained upon reasonable request by the principal investigator, EJM; email: elia.mmbaga@medisin.uio.no.

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REFERENCES

1 Global HIV & AIDS statistics - 2022 fact sheet. UNAIDS; 2022.
2 Shannon K, Goldenberg SM, Deering KN, *et al*. HIV infection among female sex workers in concentrated and high prevalence epidemics: why a structural determinants framework is needed. *Curr Opin HIV AIDS* 2014;9:174–82.
3 Wilson D. HIV programs for sex workers: lessons and challenges for developing and delivering programs. *PLoS Med* 2015;12:e1001808.
4 Hanscom B, Janes HE, Guarino PD, *et al*. Brief report: preventing HIV-1 infection in women using oral preexposure prophylaxis: a meta-analysis of current evidence. *J Acquir Immune Defic Syndr* 2016;73:606–8.
5 Leis M, McDermott M, Koziarz A, *et al*. Intimate partner and client-perpetrated violence are associated with reduced HIV pre-exposure prophylaxis (prep) uptake, depression and generalized anxiety in a cross-sectional study of female sex workers from Nairobi, Kenya. *J Int AIDS Soc* 2021;24:e25711.
6 Witte SS, Filippone P, Ssewamala FM, *et al*. Prep acceptability and initiation among women engaged in sex work in uganda: implications for HIV prevention. *EClinicalMedicine* 2022;44:101278.
7 Eakle R, Gomez GB, Naicker N, *et al*. HIV pre-exposure prophylaxis and early antiretroviral treatment among female sex workers in South Africa: results from a prospective observational demonstration project. *PLoS Med* 2017;14:e1002444.
8 Claassen CW, Mumba D, Njelesani M, *et al*. Initial implementation of prep in zambia: health policy development and service delivery scale-up. *BMJ Open* 2021;11:e047017.
9 Koss CA, Charlebois ED, Ayieko J, *et al*. Uptake, engagement, and adherence to pre-exposure prophylaxis offered after population HIV testing in rural kenya and uganda: 72-week interim analysis of observational data from the SEARCH study. *Lancet HIV* 2020;7:e249–61.
10 Karim SSA, Baxter C. HIV pre-exposure prophylaxis implementation in Africa: some early lessons. *Lancet Glob Health* 2021;9:e1634–5.
11 Stankevitz K, Grant H, Lloyd J, *et al*. Oral preexposure prophylaxis continuation, measurement and reporting. *AIDS* 2020;34:1801–11.
12 Kagaayi J, Batte J, Nakawooya H, *et al*. Uptake and retention on HIV pre-exposure prophylaxis among key and priority populations in South-central uganda. *J Int AIDS Soc* 2020;23:e25588.
13 Nunn AS, Brinkley-Rubinstein L, Oldenburg CE, *et al*. Defining the HIV pre-exposure prophylaxis care continuum. *AIDS* 2017;31:731–4.
14 World Health Organization. *Who Implementation Tool for Pre-Exposure Prophylaxis (Prep) of Hiv Infection: Module 5: Monitoring and Evaluation*. Geneva, 2018.
15 Zhang J, Li C, Xu J, *et al*. Discontinuation, suboptimal adherence, and reinitiation of oral HIV pre-exposure prophylaxis: a global systematic review and meta-analysis. *Lancet HIV* 2022;9:e254–68.
16 Hendrickson C, Long L, van de Vijver D, *et al*. Novel metric for evaluating pre-exposure prophylaxis programme effectiveness in real-world settings. *Lancet HIV* 2020;7:e294–300.
17 Mmbaga EJ, Makayo N, Leshabari MT, *et al*. *Integrated bio-behavioural survey among female sex workers in Dar Es Salaam, 2017: National Aids Control Programme, Minstry of Health, Community Developement, Gender, Elders and Children*. Tanzania: Dar es Salaam, 2018: 72.
18 Harling G, Muya A, Ortblad KF, *et al*. HIV risk and pre-exposure prophylaxis interest among female bar workers in Dar es Salaam: cross-sectional survey. *BMJ Open* 2019;9:e023272.
19 Faini D, Munseri P, Sandstrom E, *et al*. Willingness and use of HIV pre-exposure prophylaxis among female sex workers living in Dar-es-Salaam, Tanzania. *AIDS Behav* 2023;27:335–43.
20 Makyao N, Urasa P, Leornard S, *et al*. HIV prevention using oral pre-exposure prophylaxis in the United Republic of Tanzania. Results from the Demonstration Project. Poster session presented at the 23rd International AIDS Conference (AIDS 2020); San Fransisco and Aukland, US, 2020
21 Centers for Disease Control and Prevention. Models and frameworks for the practice of community engagement; 2018.
22 Baral S, Logie CH, Grosso A, *et al*. Modified social ecological model: a tool to guide the assessment of the risks and risk contexts of HIV epidemics. *BMC Public Health* 2013;13:482.
23 Kaufman MR, Cornish F, Zimmerman RS, *et al*. Health behavior change models for HIV prevention and AIDS care: practical recommendations for a multi-level approach. *J Acquir Immune Defic Syndr* 2014;66:S250–8.
24 Skovdal M. Facilitating engagement with prep and other HIV prevention technologies through practice-based combination prevention. *J Int AIDS Soc* 2019;22:e25294.
25 Sarr M, Gueye D, Mboup A, *et al*. Uptake, retention, and outcomes in a demonstration project of pre-exposure prophylaxis among female sex workers in public health centers in Senegal. *Int J STD AIDS* 2020;31:1063–72.
26 Mboup A, Diabaté S, Béhanzin L, *et al*. Determinants of HIV preexposure prophylaxis adherence among female sex workers in a demonstration study in cotonou, benin: a study of behavioral and demographic factors. *Sex Transm Dis* 2021;48:565–71.
27 Pillay D, Stankevitz K, Lanham M, *et al*. Factors influencing uptake, continuation, and discontinuation of oral prep among clients at sex worker and MSM facilities in South Africa. *PLoS One* 2020;15:e0228620.
28 Stangl AL, Earnshaw VA, Logie CH, *et al*. The health stigma and discrimination framework: a global, crosscutting framework to inform research, intervention development, and policy on health-related Stigmas. *BMC Med* 2019;17.
29 Mboup A, Béhanzin L, Guédou FA, *et al*. Early antiretroviral therapy and daily pre-exposure prophylaxis for HIV prevention among female sex workers in cotonou, benin: a prospective observational demonstration study. *J Int AIDS Soc* 2018;21:e25208.
30 Mbotwa C, Kazaura M, Moen K, *et al*. Predictors of mHealth use in promoting adherence to pre-exposure prophylaxis among female sex workers: an evaluation of the Jichunge intervention in Dar es Salaam, Tanzania. *BMC Health Serv Res* 2022;22:859.
31 Mbotwa CH, Kazaura MR, Moen K, *et al*. Effect of an mHealth intervention on retention in HIV pre-exposure prophylaxis services among female sex workers: preliminary evidence of the use of the *Jichunge* App in Dar es Salaam, Tanzania. *Digit Health* 2023;9:20552076231170507.
32 Dutta A, Barker C, Makyao N. Consensus estimates on key population size and HIV prevalence in Tanzania. In: *National AIDS Control Programme (NACP), Ministry of Health and Social Welfare*. Tanzania: Dar es Salaam, 2014.
33 Schonlau M, Liebau E. Respondent-driven sampling. *The Stata Journal* 2012;12:72–93.
34 Tyldum G, Johnston LG. Applying respondent driven sampling to migrant populations. In: *Introduction to Respondent Driven Sampling-Manual*. London, 2014.
35 National Guidelines for Management of HIV and AIDS. Ministry of health, community, Developement, gender, elderly and children, national, national AIDS control programme; 2019.
36 TSD Service Group. *Services for Sensitive Data (TSD)*. IT department. University of Oslo, 2022.
37 Kroenke K, Spitzer RL, Williams JBW. The patient health questionnaire-2: validity of a two-item depression screener. *Med Care* 2003;41:1284–92.
38 Kroenke K, Spitzer RL, Williams JBW, *et al*. Anxiety disorders in primary care: prevalence, impairment, comorbidity, and detection. *Ann Intern Med* 2007;146:317–25.
39 Babor F, Biddle-Higgins JC, Saunders JB, *et al*. *The Alcohol Use Disorders Identification Test (AUDIT): Guidelines for use in primary care*. 2nd ed: The World Health Organization, 2001.
40 Vissoci JRN, Hertz J, El-Gabri D, *et al*. Cross-cultural adaptation and psychometric properties of the audit and cage questionnaires in Tanzanian Swahili for a traumatic brain injury population. *Alcohol Alcohol* 2018;53:112–20.
41 Kerrigan D, Mbwambo J, Likindikoki S, *et al*. Project shikamana: baseline findings from a community empowerment-based combination HIV prevention trial among female sex workers in Iringa, Tanzania. *J Acquir Immune Defic Syndr* 2017;74:S60–8.
42 Broadhead WE, Gehlbach SH, de Gruy FV, *et al*. The Duke–UNC functional social support questionnaire: measurement of social support in family medicine patients. *Med Care* 1988;26:709–23.
43 Fearon E, Phillips A, Mtetwa S, *et al*. How can programs better support female sex workers to avoid HIV infection in zimbabwe? a prevention cascade analysis. *J Acquir Immune Defic Syndr* 2019;81:24–35.
44 Textor J, Hardt J, Knüppel S. Dagitty: a graphical tool for analyzing causal diagrams. *Epidemiology* 2011;22:745.
45 Greenland S, Daniel R, Pearce N. Outcome modelling strategies in epidemiology: traditional methods and basic alternatives. *Int J Epidemiol* 2016;45:565–75.
46 Sperandei S, Bastos LS, Ribeiro-Alves M, *et al*. Assessing logistic regression applied to respondent-driven sampling studies: a

simulation study with an application to empirical data. *Internat J Soc Res Methodol* 2023;26:319–33.
47 Avery L, Rotondi N, McKnight C, *et al*. Unweighted regression models perform better than weighted regression techniques for respondent-driven sampling data: results from a simulation study. *BMC Med Res Methodol* 2019;19:202.
48 Muller CJ, MacLehose RF. Estimating predicted probabilities from logistic regression: different methods correspond to different target populations. *Int J Epidemiol* 2014;43:962–70.
49 Kyongo J, Kiragu M, Karuga R, *et al*. How long will they take it? oral pre-exposure prophylaxis (prep) retention for female sex workers, men who have sex with men and young women in a demonstration project in kenya. *J Int AIDS Soc* 2018.
50 Dubov A, Altice FL, Fraenkel L. An information-motivation-behavioral skills model of prep uptake. *AIDS Behav* 2018;22:3603–16.
51 World Health Organization. *Technical Brief: What's the 2+ 1+ 1? Event-Driven Oral Pre-Exposure Prophylaxis to Prevent Hiv for Men Who Have Sex with Men: Update to Who's Recommendation on Oral Prep*. World Health Organization, 2019.
52 Kippax S. Effective HIV prevention: the indispensable role of social science. *J Int AIDS Soc* 2012;15:17357.
53 Ikeda DJ, Kidia K, Agins BD, *et al*. Roll-out of HIV pre-exposure prophylaxis: a gateway to mental health promotion. *BMJ Glob Health* 2021;6:e007212.
54 Stanton AM, O'Cleirigh C, Knight L, *et al*. The importance of assessing and addressing mental health barriers to prep use during pregnancy and postpartum in sub-Saharan Africa: state of the science and research priorities. *J Int AIDS Soc* 2022;25:e26026.
55 National Aids Control Program. *Implementation Framework for Pre-exposure prophylaxis of HIV in Tanzania Mainland*. Tanzania, mainland, 2021.
56 Hoenigl M, Hassan A, Moore DJ, *et al*. Predictors of long-term HIV pre-exposure prophylaxis adherence after study participation in men who have sex with men. *J Acquir Immune Defic Syndr* 2019;81:166–74.
57 Beckham SW, Mantsios A, Galai N, *et al*. Acceptability of multiple modalities of pre-exposure prophylaxis (prep) among female sex workers in Tanzania: a mixed-methods study. *BMJ Open* 2022;12:e058611.
58 Allen E, Gordon A, Krakower D, *et al*. HIV Preexposure prophylaxis for adolescents and young adults. *Curr Opin Pediatr* 2017;29:399–406.

III

Appendix 2

INFORMATION AND CONSENT: Dar es Salaam

Introduction

My name is _____ and I am a researcher/research assistant in this study titled *"Pragmatic Trial for HIV Pre-Exposure Prophylaxis Roll-Out in Tanzania"* which involve groups that may be at increased risk of HIV. The study is a collaboration between Muhimbili University of Health and Allied Sciences and, University of Oslo, Norway. We welcome you to participate in this scientific study. In the following we want to explain why the research is being done and what it means for you to participate. After reading this form, please ask me if there is anything that is not clear or if you would like more information.

What is the purpose of the study?

The Tanzanian government is now rolling out PrEP for populations at risk for HIV infection. The purpose of this study is to explore various factors which may influence adherence to PrEP and learn more about your views and experiences with using PrEP. Furthermore, we want to study what role mobile phones might play in promoting adherence to health-related interventions. The project will seek to find out more about how you use your mobile phone in daily life and thoughts about using mobile phones for health services.

We will include participants in Tanga and in Dar es Salaam regions and the use of PrEP among participants will later be compared. By participating in this study you will help us to understand better ways of promoting adherence to PrEP among population at risk hence reducing the burden of HIV infection in the country.

Why am I being asked to participate in this study?

You are being asked to participate in this study because you belong to a group that is at risk of HIV and eligible to receive the PrEP preventive treatment according to the Tanzania guidelines.

Do I have to take part?

It is up to you to decide whether or not to take part. If you decide not to take part in the study, there will be no negative consequences for you, and you can still receive PrEP and other services as per guidelines. If you decide to take part, you are still free to withdraw at any time and without giving a reason. There will be no negative consequences for withdrawal.

What will happen to me if I take part?

If you agree to participate in the study, you will be asked to do the following:

- You will be asked to take part in an interview which may take about 60 minutes. You will be asked questions about your personal life, experiences with health services, HIV, your sexual behavior, drug and alcohol use. You will also be asked about your opinion, expectations, and experiences with PrEP use. In the interview you will also be asked about your experience and opinion on our mobile phone application.
- You will receive a free mobile application for your phone called *Jichunge* which will be used to send you reminders for taking your medication and to provide you with information about HIV and care. The application will also give you an opportunity to talk to a health provider or a peer educator and ask questions when you have problems. The study will collect data on your use of the app.
- After the first interview you will later be asked to take part in shorter interviews each time you are attending clinical visits for PrEP, for up to 12 months after you started using PrEP. The interviews will consist of a few questions about your PrEP use. Health information from the clinical visits will also be collected, such as results from tests relevant for the continuation of the treatment. We will

also contact you for follow-up survey at 6 and 12 months.

- The study site is our site of research where the PhD students will engage in participant observation with you and other participants. This means that things that happen during baseline will be written down and used in our research publications.
- You may be asked to participate in qualitative interviews. In this case, these interviews will be tape-recorded to facilitate analysis.

There are no costs to you to participate. If you agree to participate today, you will receive 8.000 Tsh to cover cost of your transportation to this study site. We may ask you to help us to find more people like you to join the study.

Does this study involve any benefits and risks?

We do not expect that there are any major risks involved in taking part in this study. However, we do ask some questions about personal issues. Some people could feel uncomfortable sharing this kind of information. We understand that you might be concerned about sharing your identity. We are taking a lot of precaution to protect your identity in this project, which will be explained further below.
There might be a benefit for you as a person taking part, as you will get access to PrEP and a mobile health app. Your participation may also contribute into development of better ways of preventing HIV transmission to you and others in your community.

How will data be protected in this study?

All information you provide for this study will be kept confidential. This is how your data will be protected:

- The consent form will be kept separate from the data and stored in a secure safe. It will be deleted when the processing of data ends.

- No research data will be stored on any local computer, on any paper or in any physical file.

    - Instead, research data will be immediately transferred via encrypted connection to a highly secure research server. Only senior personnel authorized by the university will have access to these data (professors, PhD candidates and some IT personnel). After completing the entering of data, no junior staff member (e.g. interviewers or research assistants) will have access to any of the data.
    - The information shared by you will not be identifiable, i.e. nobody will be able to know who shared what information. This is because data will be stored under a code number and not under anybody's name, telephone number or any other identifying information.
    - While the study is ongoing, the project will need to keep a list that links code numbers to the names of study participants. This list will be stored securely and will only be accessible to the principal investigator and those he authorizes. It will be deleted when data handling ends.

- Information you enter into the Jichunge app will be made available to different persons depending on what service you use:

    - When you use the doctor service, the information will be sent to the Jichunge doctor
    - When you use the peer educator service, the information will be sent to the Jichunge peer educator

- In the chat function, you can chat anonymously with other app users (as long as you yourself do not write your name or other identifying information in your messages)
- When you register pill taking and clinic visits, the information will be stored on a secure server that will only be accessible to senior research personnel authorized by the university.
- The information you share in the Jichunge app may be transferred to our secure server, where it will be stored under code numbers and not under your name.

- Some of the functions in the Jichunge app are transmitted via "WhatsApp". Use of these functions are regulated by the ordinary WhatsApp user agreement.

What will happen to the results of the study?

The results of the study will be written up into reports and publications in academic journals. No persons will be able to be identified in any report or publication.
The project is scheduled to end on 23.07.2023. Your data will be stored until 31.07.2028, for documentation and research purposes. After 31.07.2028 your data will be completely deleted.

Your rights

So long as you can be identified in the collected data, you have the right to:

1. access the personal data that is being processed about you
2. request that your personal data to be deleted
3. request that incorrect personal data about you is corrected/rectified
4. receive a copy of your personal data (data portability)
5. send a complaint to the Data Protection Officer at the University of Oslo: personvernombud@uio.no

This study has been ethically reviewed and approved by:

- The Muhimbili University of Health and Allied Sciences Ethical Committee, Tanzania
- The National Health Research Ethics Committee (NIMRI) in Tanzania.
- The Norwegian Regional Committees for Medical and Health Research Ethics (REK), Norway

These institutions are responsible to ensure that research participants are protected. If you wish to learn more about the ethics committee, please contact:

Dr. Bruno Sunguya,
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Contact for further information about the study

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Participation Consent Form

Title of project:
Pragmatic Trial for HIV Pre-Exposure Prophylaxis Roll-Out in Tanzania

Please tick box

☐ I confirm that I have read/ information have been read to me and that I understood the information for the above study and have had the opportunity to ask questions.

☐ I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my health care services or legal rights being affected.

I give consent/agree:

☐ to participate in this study through face-to-face interviews, some of which are tape-recorded

☐ for my health data from the PrEP clinic visits to be collected

☐ for my data from the Jichunge app to be collected

☐ for my personal data to be stored after the end of the project (no later than 31.07.2028)

☐ to be contacted for follow up interviews in the future for this study

_____ _____
Signature of Participant Date

_____
Name of Participant (In capital letters)

TAARIFA NA RIDHAA YA KUSHIRIKI KATIKA UTAFITI -Dar es Salaam

Utangulizi

Jina langu ni _____ mimi ni mtafiti/msaidizi wa utafiti katika utafiti huu wenye kichwa cha habari *"Uboreshaji wa utoaji wa dawa za kujikinga na maambukizi ya virusi vya Ukimwi nchini Tanzania"* unahusisha makundi ya watu walio katika hatari kubwa ya kuambukizwa virusi vya Ukimwi. Utafiti huu unafanywa na Chuo Kikuu cha Afya na Sayansi Shirikishi cha Muhimbili kwa ushirikiano na Chuo Kikuu cha Oslo, cha nchini Norway. Tunakukaribisha uweze kushiriki katika utafiti huu. Katika vipengele vifuatavyo tunaelezea kwa nini utafiti huu unafanyika na ina maana gani kwa wewe kushiriki. Baada ya kusoma maelezo haya, tafadhali niulize kitu chochote ambacho utakuwa hujaelewa au kama unahitaji maelezo zaidi.

Ni nini lengo la utafiti huu?

Serikali imeanzisha utoaji wa dawa za kujikinga na maambukizi ya virusi vya ukimwi kwa makundi yaliyo katika hatari kubwa ya kupata maambukizi ya virusi hivyo zijulikanazo kama PrEP. Lengo la utafiti huu ni kuchunguza vitu mbalimbali ambavyo vinaweza kuchochea matumizi sahihi ya PrEP na kujifunza zaidi juu ya maoni na uzoefu wako juu ya dawa hizo. Tungependa pia kujifunza jinsi ambavyo simu ya mkononi inaweza kusaidia katika kukuza matumizi ya programu za afya. Tutapenda kujifunza namna ambavyo unatumia simu yako katika maisha yako ya kila siku na mawazo yako juu ya kutumia simu katika huduma za afya.

Utafiti huu utahusisha washiriki kutoka mikoa ya Tanga na Dar es Salaam na tutalinganisha viwango vya matumizi bora ya PrEP katika mikoa hii. Ushiriki wako katika utafiti huu utatusaidia kuelewa njia bora za kukuza matumizi sahihi ya PrEP kwa watu walio kwenye hatari kupata VVU na hivyo kusaidia kupunguza tatizo la maradhi ya VVU nchini.

Kwa nini natakiwa kushiriki katika utafiti huu?

Unaombwa kushiriki katika utafiti huu kwa sababu wewe unaweza kuwa ni sehemu ya jamii ambayo ipo katika hatari kubwa ya kupata virusi vya ukimwi, na unastahili kupewa dawa za kujikinga kulingana na miongozo ya kitaifa.

Je, ni lazima nishiriki?

Ni hiyari yako kuamua kushiriki au kutoshiriki. Kama utaamua kutoshiriki katika utafiti huu hakutakuwa na madhara yoyote kwako, na unaweza kuendelea kupata PrEP na huduma zingine kulingana na miongozo. Kama utaamua kushiriki katika utafiti huu bado una uhuru wa kujitoa muda wowote bila kutoa sababu. Hakutakuwa na madhara yoyote kwako kwa endapo utaamua kujitoa katika utafiti.

Ni nini kitatokea endapo nitaamua kushiriki katika utafiti?

1. Kama utakubali kushiriki katika utafiti huu, utaombwa kufanya yafuatayo. Utaombwa kushiriki katika mahojiano ambayo yatachukua takribani kati ya saa moja hadi masaa mawili. Tutajadili kuhusu maisha yako binafsi, uzoefu wako kuhusu huduma za afya, VVU, tabia za kimapenzi, madawa ya kulevya na matumizi ya pombe, na maoni yako juu ya dawa za PrEP. Tutajadili pia kuhusu mawazo na mtazamo wako juu ya matumizi ya simu za mkononi katika kutoa huduma za afya. Katika mahojiano pia utaulizwa juu ya uzoefu wako na maoni yako juu ya mtandao/programu yetu ya simu ya mkononi.
2. Utapokea mtandao/programu ya bure ya simu yako inayoitwa Jichunge ambayo itatumika kukumbusha kunywa dawa yako na kukupa habari kuhusu VVU na utunzaji. Programu/mtandao huo pia utakupa fursa ya kuzungumza na mtoa huduma ya afya au mwelimishaji rika na kuuliza maswali wakati una shida. Utafiti huo utakusanya taarifa juu ya matumizi yako ya programu/mtandao.

3. Baada ya mahojiano ya kwanza baadaye utaulizwa kushiriki katika mahojiano mafupi kila wakati unapohudhuria ziara za kliniki za PrEP, hadi miezi 12 baada ya kuanza kutumia PrEP. Mahojiano hayo yatakuwa na maswali machache juu ya matumizi yako ya PrEP. Habari za kiafya kutokana na mahudhurio ya kliniki pia zitakusanywa, kama matokeo kutoka kwa vipimo vinavyohusiana na mwendelezo wa matibabu. Pia tutawasiliana nawe kwa uchunguzi wa ufuatiliaji katika miezi 6 na 12.

4. Unaweza kuulizwa kushiriki mahojiano ya hali ya juu. Katika hatua hii, mahojiano haya yatarekodiwa ili kuwezesha uchambuzi

Hakuna gharama zozote kwako katika kushiriki katika utafiti huu. Utakaposhiriki, utapokea kiasi cha shilingi elfu nane (8,000/-) kwa ajili ya gharama ulizotumia kuja kushiriki. Na tunaweza kuhitaji msaada wako wa kutafuta watu wengine kama wewe ili waweze kushiriki.

Ni nini faida au madhara ya kushirki katika utafiti huu?

Hatutarajii kuwa kutakuwa na madhara makubwa ya kushiriki katika utafiti huu. Hata hivyo, tutakuuliza baadhi ya maswali kuhusu mambo yako binafsi. Baadhi ya watu hujisikia vibaya kuzungumzia taarifa zao binafsi. Tunaelewa kuwa unaweza kuwa na wasiwasi juu ya uwezekano wa kutambulika kwamba wewe upo katika makundi yenye hatari ya kupata VVU. Tunachukua tahadhari kubwa ili usije ukatambulika kama inavyoelezwa hapo chini.

Kunaweza kusiwe na faida za moja kwa moja kwako kwa kushiriki katika utafiti huu, bali ushiriki wako unaweza kuchangia katika kuandaa njia bora za kuzuia maambukizi ya VVU kwako na kwa wengine katika jamii yako.

Je, Data italindwaje katika utafiti huu?

Taarifa zote unazotoa kwa utafiti huu zitahifadhiwa kwa siri. Hivi ndivyo data yako itakavyolindwa:

Fomu ya ridhaa itatunzwa tofauti na taarifa na kuhifadhiwa katika salama. Itafutwa mara uchakataji wa taarifa utakapoisha.

Hakuna taarifa ya utafiti itakayohifadhiwa kwenye kompyuta, kwenye karatasi au kwenye faili yoyote.

1. Badala yake, taarifa ya utafiti itahamishwa mara moja kupitia muunganisho uliosimbwa kwa njia salama kwa seva ya utafiti yenye usalama sana. Wafanyakazi waandamizi tu walioidhinishwa na chuo kikuu ndio watapata taarifa hizi (maprofesa, wafunzi wa uzamivu na wafanyikazi wengine wa IT). Baada ya kukamilisha uingizaji wa taarifa, hakuna mfanyakazi msaidizi (kwa mfano wahojiwa au wasaidizi wa utafiti) atakayepata taarifa yoyote.
2. Taarifa uliyotoa wewe haitatambulika, i.e. hakuna mtu atakayeweza kujua ni nani alishiriki kutoa taarifa gani. Hii ni kwa sababu taarifa itahifadhiwa kwa nambari badala ya jina la mtu yeyote, nambari ya simu au habari nyingine yoyote inayotambulisha.
3. Wakati utafiti unaendelea, mradi utahitaji kuweka orodha inayounganisha nambari za nambari na majina ya washiriki wa utafiti. Orodha hii itahifadhiwa salama na itapatikana tu kwa mpelelezi mkuu na wale anaowaidhinisha. Itafutwa utunzaji wa data utakapoisha.

Taarifa unayoweka kwenye programu ya Jichunge itapatikana kwa watu tofauti kulingana na huduma unayotumia:

- Unapotumia huduma ya daktari, taarifa hiyo itatumwa kwa daktari wa Jichunge
- Unapotumia huduma ya uelimishaji rika, taarifa hiyo itatumwa kwa mwalimishajirika wa Jichunge
- Katika jukwaa la majadiliano, unaweza kujadiliana na wenzako bila kujulikana na watumiaji wengine wa programu (maadamu wewe mwenyewe hauandiki jina lako au taarifa zingine zinazotambulisha katika ujumbe wako)
- Unaposajili matumizi ya vidonge na kuhudhuria kliniki, taarifa hiyo itahifadhiwa kwenye seva salama ambayo itapatikana tu kwa wafanyakazi wakuu wa utafiti walioidhinishwa na chuo kikuu.

- Taarifa unayoshiriki katika programu ya Jichunge inaweza kuhamishiwa kwenye seva yetu salama, ambapo itahifadhiwa kwa nambari na sio chini ya jina lako.

Baadhi ya huduma katika programu ya Jichunge hutumia "WhatsApp". Matumizi ya huduma hizi zinasimamiwa na makubaliano ya kawaida ya mtumiaji wa WhatsApp.

Kitu gani kitatokea kwa matokeo ya utafiti?
Matokeo ya utafiti huu yataandikwa kama ripoti na yatachapishwa katika majarida ya kitaaluma. Hakuna mtu yoyote atakayetambulika katika ripoti au machapisho ya utafiti huu.
Mradi huu umepangwa kuisha tarehe 23.07.2023. Taarifa zako zitatuzwa mpaka tarehe 31.07.2028, kwa ajili ya kumbukumbu za kitafiti. Baada ya 31.07.2028 taarifa zako zitafutwa kabisa.

Haki zako:
Haki ulizonazo kuhusu taarifa zako zilizokusanywa na zinazotambulika zitakuwa:
- Kupata taarifa binafsi ambazo zinafanyiwa kazi
- Kuomba taarifa zako binafsi zifutwe
- Kuomba taarifa zako zisizo sahihi kurekebishwa
- Kupata nakala ya taarifa zako binafsi, na
- Kutuma malalamiko kwa afisa anayehusika na kulinda taarifa zako katika Chuo Kikuu cha Oslo: personvernombud@uio.no

Utafiti huu umepitiwa na kuidhinishwa na:

- Kamati ya maadili ya Chuo Kikuu cha Afya na Sayansi Shirikishi cha Muhimbili, Tanzania
- Kamati ya kitaifa ya maadili ya tafiti za tiba na afya (NIMR), Tanzania
- Kamati ya kanda ya maadili ya tiba na utafiti wa afya (REK), Norway

Taasisi hizo zinawajibika kuhakikisha kuwa washiriki wa utafiti wanalindwa. Kama utataka kujifunza zaidi kuhusu kamati hizi za maadili, tafadhali wasiliana na:

Dr. Bruno Sunguya,
Mwenyekiti, Kamati ya Maadili ya kitafiti MUHAS,
Simu: +255 22 2152489
Barua pepe: drp@muhas.ac.tz

Mawasiliano kuhusu taarifa zaidi za utafiti huu:
1. Prof. Melkizedeck Leshabari
Chuo Kikuu cha Afya na Sayansi Shirikishi cha Muhimbili, Dar es Salaam, Tanzania
Simu: +255 783287062

Barua pepe: mleshabari@gmail.com

2. Prof. Elia John Mmbaga
Chuo Kikuu cha Oslo, Norway
Simu: +4747728384
Barua pepe: ejmmbaga@medisin.uio.no

Fomu ya Ridhaa ya Kushiriki

Jina la utafiti:
Uboreshaji wa utoaji wa dawa za kujikinga na maambukizi ya virusi vya Ukimwi nchini Tanzania

Tafadhali weka vema kwenye kisanduku

☐ ninadhibitisha kwamba nimesoma/nimesomewa na kuelewa taarifa za utafiti uliotajwa hapo juu na nimepata nafasi ya kuuliza maswali

☐ Ninaelewa kwamba ushiriki wangu ni wa hiari na niko huru kujitoa wakati wowote bila kutoa sababu yoyote na bila ya kuathiri haki yangu ya huduma za afya au haki za kisheria.

Ninatoa ridhaa/nakubali:

☐ kushiriki katika utafiti huu kwa njia ya mahojiano na ambapo mengine yatarekodiwa

☐ Kukusanywa na kutumika kwa taarifa zangu za PreP na za kiafya zilizopo kliniki

☐ Kukusanywa na kutumika kwa taarifa zangu kutoka program ya Jichunge

☐ taarifa zangu binafsi kuhifadhiwa baada ya mradi kuisha (si zaidi ya 31.07.2028)

☐ watafiti kuwasiliana na mimi kwa ajili ya mahojiano mengine baadaye katika utafiti huu

_____ _____
Sahihi ya mshiriki Tarehe

_____
Jina la mshiriki (Herufi kubwa)

Quantitative Questionnaire-FSW

Section 0: Study Identification

No.	Questions	Coding Categories	Skip to
Q001	Study ID	|__|__|__|__|__|	
Q002	Coupon Number	|__|__|__|__|__|__|__|	
Q003	City	Dar es Salaam 1 Tanga 2	
Q004a	Muncipality	Ilala 1 Kinondoni 2 Temeke 3 Ubungo 4 Kigamboni 5	
Q004b	Region	Tanga 1 Muheza 2 Mkinga 3 Pangani 4 Korogwe 5 Handeni 6 Kilindi 7 Lushoto 8	
Q005	Jichunge number	|__|__|__|__|__|	
Q006	What is your first name?		
Q007	What is your last name?		
Q008	Telephone number		
Q009	What region/province were you born?		
Q010	What is your birth order (order you as a child was born into the family)		
Q011	What is your birth date?	Day |__|__| Month |__|__| Year |__|__|	
Q012	Make the participant's identity number/code by asking the same questions as you asked above: 1. Birth province: the three first letters, (for example; Tanga is TAN) 2. Which is your birth rank: 2 digits(for example number 5 is 05) 3. Birth date: 2 digits (for example 9. June is 09) 4. Year you were born: 2 digits (for example 1980 is 80. (if you were born after 2000; for example in 2001 would be 01)		

No.	Questions	Coding Categories	Skip to
Q001	Study ID	|__|__|__|__|__|__|	
Q013	Interviewer's ID	|__|__|__|__|	
Q014	Date of interview	Day |__|__| Month |__|__| Year |__|__|	
00	Time Started	|__|__|	

Section 1: Network

Introductory statement (READ ALOUD TO RESPONDENT): *Now I would like to ask you some questions about other FSW that you may know, including the person who recruited you into this study. Please remember that no one will be able to find out what you tell me so please be truthful.*

No.	Questions	Coding categories	Skip to
Q101	How many female sex workers do you know personally (i.e., who are living in Dar es Salaam/Dodoma, are 18 years and above, you know their names, you know who they are and they know you)?	|__|__|__|	
Q102	How many of these (repeat the number in Question 101) Female Sex Workers have you seen during the past one month?	|__|__|__|	
Q103	Would you have given a coupon to the same person who gave this coupon to you?	Yes 1 No 2 No Response 98	
Q104	How would you best describe your relationship to the person who referred you to this study, that is, the person who gave you this coupon? (Do not read the responses to the participant.)	A stranger, someone you met for the first time 1 Someone you know a little 2 A friend, but not close 3 A close friend, someone you know very well 4 A family member 5 Others, Mention……88 No response 98	
Q105	How often do you see your recruiter?	Every day 1 Several times per week, but not every day 2 Once per week 3 Less than once per week, but more than once a month 4 Once per month 5 Less than once per month 6	

		No response 98	
Q106	About how long have you known your recruiter?	_____(in months)	
Q107	What is the primary reason you decided to accept a coupon and enroll in the study (if deemed eligible)? *Do not read responses* *(Circle one response only)*	For incentive 1 For STI/HIV test results 2 Peer influence 3 Study seems interesting/useful 4 Had time to spend 5 Others, specify…… 88 No response 98	

Section 2: Sociodemographic characteristics

Introductory statement (READ ALOUD TO RESPONDENT): *I would like to ask you a few questions on your background, including information on your age, education, jobs and income etc.*

No.	Questions	Coding categories	Skip to
Q201	How old are you?	----------(In complete years)	
Q202	What is the highest level of education you have completed?	No formal education 1 Some primary 2 Completed primary 3 Some secondary 4 Completed secondary 5 Above secondary/University/college 6 No response 98	
Q203	What is your current marital status?	Single 1 Married 2 Cohabiting 3 Separated 4 Divorced. 5 Widowed. 6 No response 98	➡ Q204 ➡ Q205 ➡ Q205 ➡ Q205 ➡ Q205
Q203a	If married or cohabiting, does your partner know you are a sex worker	Yes 1 No 2 No response 98	
Q204	How many persons are you currently living together with?	__ __ persons	

Q205	Who are you currently living with?	Living alone 1 Living with husband 2 Living with boyfriend 3 Living with other relatives 4 Living with friends 5 Other (specify) ……88 No response 98	
Q206	Do you have children of your own?	Yes 1 No 2 No answer 98	➡ Q207 →Q207
Q206b	If yes, do you live with any of your children?	Yes 1 No 2 No answer 98	
Q207	Other than sex work, what kinds of things do you do to earn money? *Read out list - Circle all mentioned*	No other income beside sex work 1 Government employee 2 Employed in private sector 3 Student 4 Self-employed 5 Others (specify)_____ 88 No response 98	
Q208	What is your total income per month?	_____(TZS)	

Section 3: Sex work

Introductory statement (READ ALOUD TO RESPONDENT): *Now I will ask you some questions about your work as a sex worker. Some of the questions are intimate. Please remember that your responses are anonymous and completely private.*

No.	Questions	Coding Categories	Skip to
Q301	How old were you when you had sexual intercourse (vaginal or anal sex) for the <u>first</u> time?	_____ years Don't remember 97 No response 98	
Q302	How old were you when you sold sex for the <u>first</u> time?	_____ years Don't remember 97 No response 98	

Q303	When you started selling sex, what was the most important reason? (*Multiple answers possible)*	Needed money to help family 1 Needed money to pay personal debt 2 Needed money for my basic needs 3 Was forced 4 Like to do it/pleasure 5 Friends/family were doing it 6 Good income 7 Other, specify _____ 88 No response 98	
Q304	Where is your <u>primary</u> (place you go mostly) place to get in contact with clients? *(Select one)*	Pub/Bar/Disco/Club 1 Guesthouse/hotel/rented room 2 In a brothel 3 On the streets 4 Through telephone 5 Through internet 6 Through agent 7 Other_____ 88 No response 98	
Q305	Where is your <u>primary</u> place (place you use most) to have sexual intercourse with a client?	Rented room (Guesthouse/hotel) 1 A brothel 2 Outdoors 3 At my home 4 At the client's home. 5 Others----------88 No response 98	
Q306	Within the last 6 months have you ever travelled to another city or county to perform sex work	Yes 1 No 2 No response 98	
Q307	The <u>last time</u> you had sexual intercourse with a client, how much were you paid?	_____ TZS Don't remember 97 No response 98	
Q308	What is your total monthly income that comes from sex work?	_____ TZS Don't remember 97 No response 98	
Q309	Are you a part of any organization for sex workers?	Yes 1 No 2	

Section 4: Sexual practices and sexual partners

Q401a	Do you have a steady partner(s)?	Yes 1 No 2 No answer 98	**-> If answer is "NO" skip all questions about "steady partner"**
Q402a	Do you ever have anal sex with clients?	Yes 1 No 2 No answer 98	**-> If answer is "NO" skip all questions about anal sex with paying clients**
Q401b	Do you ever have anal sex with you steady partner(s)?	Yes 1 No 2 No answer 98	**-> If answer is "NO" skip all questions about anal sex with mpenzi wa kudumu**

Na.		**Steady partner(s)**	**Paying clients**
Q401c Q402b	In the past one month: how many [*partners*] did you have vaginal sexual intercourse with? *If you don't know, write 997*	-------- (*andika idadi*)	-------- (*andika idadi*)
Q401d Q402c	In the past one month: how many [*partners*] did you have anal sexual intercourse with? *If you don't know, write 997*	-------- (*andika idadi*)	-------- (*andika idadi*)
Q402d	The last day you worked; how many clients did you have vaginal sexual intercourse with? *If you don't know, write 997*		-------- (*andika idadi*)
Q402e	The last day you worked; how many clients did you have anal sexual intercourse with? *If you don't know, write 997*		-------- (*andika idadi*)
Q401e Q402f	Did you use a condom the last time you had vaginal sex with [*partner*]?	Yes 1 No 2 Don't remember 97 No answer 98	Yes 1 No 2 Don't remember 97 No answer 98
Q401f	If not used during the last vaginal sex, did you know that [partner] was on ART?	Yes 1 No 2 Don't remember 97	*Don't ask question for client partners*

Na.		Steady partner(s)	Paying clients
		No answer 98	
Q401g Q402g	Did you use a condom the last time you had anal sex with [*partner*]?	Yes 1 No 2 Don't remember 97 No answer 98	Yes 1 No 2 Don't remember 97 No answer 98
Q401h	If not used the last time you had anal sex, did you know that [partner] was on ART?	Yes 1 No 2 Don't remember 97 No answer 98	*Don't ask question for client partners*
Q401i Q402h	Did you use any water/silicone-based lubricant the last time you had anal sex with?	Yes 1 No 2 Don't remember 97 No answer 98	Yes 1 No 2 Don't remember 97 No answer 98
Q401j Q402i	In the past one month: have you refused to have sex with a [partner] because he did not accept to use a condom?	Yes 1 No 2 Don't remember 97 No answer 98	Yes 1 No 2 Don't remember 97 No answer 98
Q401l Q402j	In the past one month: Have you accepted sex without a condom for increased pay (compared to sex with a condom?)		Yes 1 No 2 Don't remember 97 No answer 98
Q401m Q402k	In the past one month: Have you accepted to have anal sex for increased pay (compared to vaginal sex?)		Yes 1 No 2 Don't remember 97 No answer 98

Section 5:

FSW stigma, violence and incarceration (structural determinants)

Introductory statement (READ ALOUD TO RESPONDENT): *We will now ask you some questions about difficult times you might have had and experiences that you might have encountered and negative feelings or attitudes that some sex workers might have towards themselves. These statements do not represent the interviewers' feelings or thoughts*

No.	Questions	Coding categories	Skip to
Q501	How often have you been discriminated against/mistreated by family, friends or the people in the community because you are a sex worker?	Never 1 Less than monthly 2 Monthly 3 Weekly 4 Daily or almost daily 5	
Q502	Have you experienced physical violence in the past 12 months?	Yes 1 No 2	 Q504

		Don't remember 97 No response 98	➡Q504 ➡Q504
Q503	If yes, who were you physically abused by? *(Circle all that are relevant)*	One-time client 1 Regular client 2 Steady partner/boyfriend/girlfriend 3 Family member 4 Co-worker 5 Police 6 Others, Specify, _____88	
Q504	Have you ever been forced to have sex in the past 12 months?	Yes 1 No 2 Don't remember 97 No response 98	 ➡ Q507 ➡ Q507 ➡ Q507
Q505	If yes, on how many occasions during the past 12 months have you been forced to have sex?	_____(Number)	
Q506	If yes, who forced you to have sex? *(Circle all that are relevant)*	One-time client. 1 Regular client. 2 Steady. 3 partner/boyfriend/girlfriend. 4 Co-worker. 5 Police. 6 Others, specify, _____88	
Q507	Have you been arrested by police in the past 12 months?	Yes No No response 98	 ➡Q601
Q508	What crime have you been arrested for?	Selling sex 1 Loitering 2 Assault 3 Same-sex relations 4 Other 88 No response 98	
Now we are going to talk a little about how you feel working as a female sex worker. Please tell me if you completely disagree, disagree, agree, or totally agree with the following statements:			
Q509	Working as a sex worker makes you feel like a bad person.	Strongly agree 1 Agree 2 Disagree 3 Strongly disagree 4	
Q510	You feel like you're not as good as others because you are a sex worker	Strongly agree 1 Agree 2 Disagree 3 Strongly disagree 4	
Q511	People's attitudes about sex work make you feel worse about yourself.	Strongly agree 1 Agree 2 Disagree 3 Strongly disagree 4	

Q512	You feel guilty because you are a sex worker.	Strongly agree 1 Agree 2 Disagree 3 Strongly disagree 4	
Q513	You feel ashamed of sex work.	Strongly agree 1 Agree 2 Disagree 3 Strongly disagree 4	
Q514	It's easier to avoid friendships than worry about telling others you are a sex worker.	Strongly agree 1 Agree 2 Disagree 3 Strongly disagree 4	
Q515	You feel completely worthless because you are a sex worker.	Strongly agree 1 Agree 2 Disagree 3 Strongly disagree 4	
Q516	You feel that you brought a lot of trouble to your family because you are a sex worker.	Strongly agree 1 Agree 2 Disagree 3 Strongly disagree 4	
Q517	You like your job as a sex worker.	Strongly agree 1 Agree 2 Disagree 3 Strongly disagree 4	
Q518	You feel okay about being a sex worker.	Strongly agree 1 Agree 2 Disagree 3 Strongly disagree 4	
Q519	You feel comfortable telling others that you are a sex worker.	Strongly agree 1 Agree 2 Disagree 3 Strongly disagree 4	
Q520	You see sex work as work, just like any other job.	Strongly agree 1 Agree 2 Disagree 3 Strongly disagree 4	
Q521	You deserve respect as a sex worker.	Strongly agree 1 Agree 2 Disagree 3 Strongly disagree 4	

Section 6: HIV knowledge and access to Health-related services

Introductory statement (READ ALOUD TO RESPONDENT): *In this section, I will read some statements about HIV and AIDS and access to related services. Some are true and some are not true. Please tell me whether you agree or disagree with each statement.*

No.	Questions	Coding Categories	Skip to
Q601	Having sex with only one faithful uninfected partner reduces the risk of HIV transmission.	True 1 False 2 Don't know 97 No response. 98	
Q602	A healthy-looking person can have HIV	True 1 False 2 Don't know 97 No response. 98	
Q603	Using a condom every time during anal sex reduces the risk of HIV transmission.	True 1 False 2 Don't know 97 No response. 98	
Q604	Use of ARV for people living with HIV can prevent HIV transmission (TasP)	True 1 False 2 Don't know 97 No response. 98	
Q605	HIV can be spread by mosquitoes or other insect bites.	True 1 False 2 Don't know 97 No response. 98	
Q606	Have you ever had an HIV test before you enrolled in this study	Yes 1 No 2 No response 98	
Q607	Can you obtain a male condom every time you need one?	Yes 1 No 2 No response 98	->609 ->609
Q608	Why can't you get a male condom every time you need one? *Multiple responses possible*	Costs too much 1 Out of stock 2 Places to get them are too far away 3 Embarrassed to buy condom 4 Don't know where to obtain 5 Things happen too fast 6 Don't need condom 7 Other_____ 88 No response. 98	
Q609	Where do you usually obtain a male condom if you need one?	Health units 1 Pharmacy 2 Shops 3 From organizations 4 From friends 5 Other, specify_____88 No response. 98	
Q610	Can you obtain lubricant every time you need it?	Yes 1 No 2 No response 98	->6 ->6
Q611	Why can you not get lubricant every time you need it? *Multiple responses possible.*	Costs too much 1 Out of stock 2 Places to get them are too far away 3	

No.	Questions	Coding Categories	Skip to
		Embarrassed to buy condom 4 Don't know where to obtain 5 Things happen too fast 6 Don't need condom 7 Other_____ 88 No response. 98	
Q612	Where do you usually obtain lubricant if you need it?	Health units 1 Pharmacy 2 Shops 3 From organizations 4 From friends 5 Other, specify_____88 No response. 98	
Q613	In the last six months, have you had/or been diagnosed with a sexually transmitted disease?	Yes 1 No 2 No response 98	
Q614	Are you currently taking any oral medication for any medical condition except PrEP pills?	Yes 1 No 2 No response 98	

Section 7: Pre-Exposure prophylaxis information (1), motivation (2) and behavioral skills (3) (self-efficacy)

PrEP knowledge/information

Introductory statement (READ ALOUD TO RESPONDENT): *Some of the following statements about PrEP are true and some are false. If you are not sure about the answer, please do not guess, but answer "don't know".*

No.	Questions	Coding Categories	Skip to
Q701	PrEP provides protection against other sexually transmitted infections	True 1 False 2 Don't know 97 No response 98	
Q702	The short-term side effects of PrEP may include nausea and dizziness	True 1 False 2 Don't know 97 No response 98	
Q703	You should not use PrEP if you don't know your HIV status	True 1 False 2 Don't know 97 No response 98	
Q704	If you don't take PrEP consistently/as prescribed, there may not be enough medicine in your body to block the HIV virus	True 1 False 2 Don't know 97 No response 98	

No.	Questions	Coding Categories	Skip to
Q705	PrEP can be taken by people who already have HIV	True 1 False 2 Don't know 97 No response 98	
Q706	You must attend regular follow up visits including testing for HIV while taking PrEP	True 1 False 2 Don't know 97 No response 98	
Q707	It is recommended to use condoms even if you are on PrEP	True 1 False 2 Don't know 97 No response 98	
Q708	Only the female partners in a sexual relationship should use PrEP	True 1 False 2 Don't know 97 No response 98	

PrEP motivation

Introductory statement (READ ALOUD TO RESPONDENT): *In the following sections we will present some statements about how you perceive your HIV risk and thought about PrEP use.*
(after Q709: Now I'll ask you some questions, please answer if you totally agree, agree, neither agree nor disagree, disagree or totally disagree)

No.	Questions	Coding Categories	Skip to
Q709	What do you think is your risk of HIV infection?	High risk 1 Medium risk 2 Low risk 3 No risk 4 Don't know 97 No response 98	
Q710	You have been worried about getting HIV	Strongly disagree 1 Disagree 2 Neither agree nor disagree 3 Agree 4 Strongly agree 5	
Q711	You will be less worried about HIV when using PrEP	Strongly disagree 1 Disagree 2 Neither agree nor disagree 3 Agree 4 Strongly agree 5	
Q712	It is important for you not to get HIV	Strongly disagree 1 Disagree 2 Neither agree nor disagree 3 Agree 4 Strongly agree 5	
Q713	Sex will be better when I am taking PrEP	Strongly disagree 1	

No.	Questions	Coding Categories	Skip to
		Disagree 2 Neither agree nor disagree 3 Agree 4 Strongly agree 5	
Q714	You find it difficult to always use condoms	Strongly disagree 1 Disagree 2 Neither agree nor disagree 3 Agree 4 Strongly agree 5	
Q715	You will feel more in control of your sexual health when taking PrEP	Strongly disagree 1 Disagree 2 Neither agree nor disagree 3 Agree 4 Strongly agree 5	
Q716	Taking PrEP is safe	Strongly disagree 1 Disagree 2 Neither agree nor disagree 3 Agree 4 Strongly agree 5	
Q717	When you are on PrEP you will be concerned about the potential side- effects of PrEP	Strongly disagree 1 Disagree 2 Neither agree nor disagree 3 Agree 4 Strongly agree 5	
Q718	Your permanent partner(s) will be supportive of me using PrEP	Strongly disagree 1 Disagree 2 Neither agree nor disagree 3 Agree 4 Strongly agree 5	
Q719	You will be worried if clients find out that you are using PrEP	Strongly disagree 1 Disagree 2 Neither agree nor disagree 3 Agree 4 Strongly agree 5	
Q720	Many FSW in your community are taking or considering taking PrEP	Strongly disagree 1 Disagree 2 Neither agree nor disagree 3 Agree 4 Strongly agree 5	

Stigma for PrEP users Introductory Information: (READ INTERVIEWEE ALOUD): In the following sections we will present several statements on how you think about PrEP's use
Answers: I totally disagree, I disagree, I disagree, nor deny it, I agree at all

Q721	My friends would think less of me if they found out I was using PrEP	Strongly disagree 1 Disagree 2 Neither agree nor disagree 3 Agree 4 Strongly agree 5	

Q722	My family would think less of me if they found out I was using PrEP	Strongly disagree 1 Disagree 2 Neither agree nor disagree 3 Agree 4 Strongly agree 5	
Q723	People would feel uncomfortable with me if they found out that I used PrEP	Strongly disagree 1 Disagree 2 Neither agree nor disagree 3 Agree 4 Strongly agree 5	
Q724	People would avoid me if they found out that I used PrEP	Strongly disagree 1 Disagree 2 Neither agree nor disagree 3 Agree 4 Strongly agree 5	
Q725	I would worry that people tell others that I am using PrEP	Strongly disagree 1 Disagree 2 Neither agree nor disagree 3 Agree 4 Strongly agree 5	
Q726	People would think that I have sex with a lot of different people when I am using PrEP	Strongly disagree 1 Disagree 2 Neither agree nor disagree 3 Agree 4 Strongly agree 5	
Q727	People would think that I like having strange types of sex when I am using PrEP	Strongly disagree 1 Disagree 2 Neither agree nor disagree 3 Agree 4 Strongly agree 5	
Q728	PrEP is mostly meant for people who can't use condoms	Strongly disagree 1 Disagree 2 Neither agree nor disagree 3 Agree 4 Strongly agree 5	
Q729	People is mostly meant for people who do not have a lot of money	Strongly disagree 1 Disagree 2 Neither agree nor disagree 3 Agree 4 Strongly agree 5	
Q730	If I were to bring up the subject of PrEP with my partner, he would think that I am having risky sex with other people.	Strongly disagree 1 Disagree 2 Neither agree nor disagree 3 Agree 4 Strongly agree 5	

PrEP behavioral skills/self-efficacy

(Continue directly from the questions above, just alter answer options): **Introductory statement (READ ALOUD TO RESPONDENT)** *I am now going to read to you some statements and would request you to score from 0 to 4 where 4 means Very confident" and 0 means not at all confident.*

No.	Questions	Coding Categories	Skip to
Q731	How confident are you that you will make PrEP part of you daily routine?	Not at all confident 0 Only slightly confident 1 Somewhat confident 2 Moderately confident 3 Very confident 4	
Q732	How confident are you that you can get PrEP refills before you run out	Not at all confident 0 Only slightly confident 1 Somewhat confident 2 Moderately confident 3 Very confident 4	
Q733	How confident are you that you that you can continue with your PrEP regimen even if getting to your clinic appointment is a major hassle?	Not at all confident 0 Only slightly confident 1 Somewhat confident 2 Moderately confident 3 Very confident 4	
Q734	How confident are you that you will discuss any problems you have relating to taking PrEP with a health provider?	Not at all confident 0 Only slightly confident 1 Somewhat confident 2 Moderately confident 3 Very confident 4	
Q735	How confident are you that you will attend the follow-up visits at the clinic?	Not at all confident 0 Only slightly confident 1 Somewhat confident 2 Moderately confident 3 Very confident 4	
Q736	How confident are you that you will stick to your PrEP medication even if you have some side effects (e.g nausea)	Not at all confident 0 Only slightly confident 1 Somewhat confident 2 Moderately confident 3 Very confident 4	

Section 8: Alcohol use (AUDIT)

Introductory statement (READ ALOUD TO RESPONDENT): *Now I would like to ask you some questions about alcohol use. Please remember that your answers will remain confidential.*

No.	Questions	Coding Categories	Skip to
Q801	Have you drunk alcohol the last year?	Yes 1 No 2 No response 98	➡Q901
Q802	How often did you have a drink containing alcohol in the past year?	Once a month or less 1 2-4 times a month 2 2-3 times a week 3 4 or more times a week 4	

Q803	What is the number of drinks containing alcohol do you drink on a typical day	1-2 1 3-4 2 5-6 3 7-9 4 10 or more 5	
Q804	In the last year, often do you have 6 or more drinks on one occasion?	Never 1 Less than monthly 2 Monthly 3 Weekly 4 Daily or almost daily 5	
Q805	How often during the last year have you found that you were not able to stop drinking after you had started?	Never 1 Less than monthly 2 Monthly 3 Weekly 4 Daily or almost daily 5	
Q806	How often during the last year have you failed to do what was expected from you because of drinking?	Never 1 Less than monthly 2 Monthly 3 Weekly 4 Daily or almost daily 5	
Q807	How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?	Never 1 Less than monthly 2 Monthly 3 Weekly 4 Daily or almost daily 5	
Q808	How often during the last year have you had a feeling of guilt or remorse after drinking?	Never 1 Less than monthly 2 Monthly 3 Weekly 4 Daily or almost daily 5	
Q809	How often during the last year have you been unable to remember what happened the night before because you had been drinking?	Never 1 Less than monthly 2 Monthly 3 Weekly 4 Daily or almost daily 5	
Q810	Have you or someone else been injured as a result of your drinking?	No 1 Yes, but not in the last year 2 Yes, during the last year 3	
Q811	Has a relative or friend or a doctor or another health worker been concerned about your drinking or suggested you cut down?	No 1 Yes, but not in the last year 2 Yes, during the last year 3	
Q812	The last time you had sex with a client had you drunk alcohol?	Yes 1 No 2 No response Don't remember	

Section 9: Drug use

Introductory statement (READ ALOUD TO RESPONDENT): *Now I would like to ask you some questions about drug use. Please remember that your answers will remain confidential.*

No.	Questions	Coding Categories	Skip to
Q901a	Have you ever used drugs (illicit drugs, including cannabis) other than those required for medical reasons	Yes 1 No 2	 ➡ Q1001
Q901b	If yes which drugs?	Cannabis 1 Khat 2 Heroin 3 Cocaine 4 Amphetamine 5 Inhalants (shoe polish, glue, petrol) Benzodazepines (Diazepam, rivotril, Xanor) 6 Ketamine. 7 Crystal meth. 8 Mephedrone. 9 Other----------(specify) 97	
Q902	Have you ever injected drugs?	Yes 1 No 2 No response 98	 ->904 ->904
Q903a	During the past 6 months have you injected drugs?	Yes 1 No 2 No response 98	 ->904 ->904
Q903b	If yes which drugs?	Heroin 1 Cocaine 2 Amphetamine 3 Other----------(specify) 97	
Q904	Have you ever used drugs (including cannabis) more than you meant to?	Yes 1 No 2 No response. 98	
Q905	Have you felt you wanted or need to cut down on your drug use (including cannabis)?	Yes 1 No 2 No response. 98	
Q906	The last time you had sex with a client, did you use any drug (including cannabis)?	Yes 1 No 2 No response. 98 Don't remember. 99	

Section 10: Social support: ((Duke–UNC Functional Social Support Questionnaire (FSSQ)
Introductory statement (READ ALOUD TO RESPONDENT): *Here is a list of some things that other people do for us or give us that may be helpful or supportive". Please read the answer options carefully. The answers options are: "Much less than I would like=1", "Less than I would like =2", "Some, but would like more" =3, "Almost as much as like =4" and "As much as I like = 5". And please tell me what is closest to our situation".*

No.	Questions	Coding categories	Skip to
Q1001	I have people who care what happens to me	Much less than I would like 1 Less than I would like 2 Some, but would like more 3 Almost as much as I like 4 As much as I like 5	
Q1002	I get love and affection	Much less than I would like 1 Less than I would like 2 Some, but would like more 3 Almost as much as I like 4 As much as I like 5	
Q1003	I get chances to talk to someone about problems at work or with my housework	Much less than I would like 1 Less than I would like 2 Some, but would like more 3 Almost as much as I like 4 As much as I like 5	
Q1004	I get chances to talk to someone I trust about my personal or family problems	Much less than I would like 1 Less than I would like 2 Some, but would like more 3 Almost as much as I like 4 As much as I like 5	
Q1005	I get chances to talk about money matters	Much less than I would like 1 Less than I would like 2 Some, but would like more 3 Almost as much as I like 4 As much as I like 5	
Q1006	I get invitations to go out and do things with other people	Much less than I would like 1 Less than I would like 2 Some, but would like more 3 Almost as much as I like 4 As much as I like 5	
Q1007	I get useful advice about important things in life	Much less than I would like 1 Less than I would like 2 Some, but would like more 3 Almost as much as I like 4 As much as I like 5	
Q1008	I get help when I am sick in bed	Much less than I would like 1 Less than I would like 2 Some, but would like more 3 Almost as much as I like 4 As much as I like 5	

Section 11: Access and satisfaction with health services

I am going to ask you, questions to find out about access to services and your satisfaction the last time you went to seek health care.

No.	Questions	Coding categories	Skip to
Q1101	In general, would you say that your health is…	Excellent 1 Very good 2 Good 3 Fair 4 Poor 5	
Q1102	Over the last two weeks, how often have you been bothered by the following problems?: Little Interest or pleasure in doing things	Not at all 1 Several days 2 More than half the days 3 Nearly every day 4	
Q1103	Over the last two weeks, how often have you been bothered by the following problems?:Feeling down, depressed or hopeless	Not at all 1 Several days 2 More than half the days 3 Nearly every day 4	
Q1104	Over the last two weeks, how often have you been bothered by the following problems: Feeling nervous, anxious or on edge?	Not at all 1 Several days 2 More than half the days 3 Nearly every day 4	
Q1105	Over the last two weeks, how often have you been bothered by the following problems: Not being able to stop or control worrying?	Not at all 1 Several days 2 More than half the days 3 Nearly every day 4	
Q1106	The last time you had a health concern, where did you go?	Pharmacy 1 Public health facility 2 Private health facility 3 Outreach 4 Peer educator/NGO 5 Treated myself at home 6 Traditional healer 7 Did not do anything/go anywhere 8 Don't remember 97 No response 98	
Q1107	Have you ever experienced financial difficulties as a result of spending on health care?	Yes 1 No 2 Don't remember 97 No response 98	
Q1108	The last time you went to a health facility for care, to what extent did you feel that the healthcare provider was supportive to you?	Very unsupportive 1 Unsupportive 2 Supportive 3 Very supportive 4 No response. 98	

Q109	The last time you went to a health facility for care, to what extent were you satisfied with the way you were generally treated in the health facility?	Very rude 1 Rude 2 Friendly 3 Very friendly 4 No response 98	

Section 12: MHealth and Jichunge app

Now I would like to ask you some questions about mobile health apps

Q1201	How would you rate your familiarity with smartphones	Very familiar 1 Familiar 2 Unfamiliar 3 Very unfamiliar 4 No response 98	
Q1202	How often do you open data in your smartphone	Many times a day 1 Once or twice a day 2 Not every day, but 2-6 times a week 3 About once a week 4 Less than once a week 5	
Q1203	Over the past one week, how much money have you spent on data/bundle?	_____(TZS)	
Q1204	Over the past three month, has there been some periods when you did not have access to data? (For any reason)	Yes 1 No 2	->1205
Q1204a	If yes, how many days in total were you without access to smartphone in the past three month	_____(days)	
Q1204b	What was the reason you did not have data access in these periods	Could not afford bundles. 1 Phone got lost or stolen. 2 Phone was not working. 3 Other, specify_____88 Don't remember. 97 No response. 98	
Q1205	Which ones are the most common social media mobile apps that you have used? (CIRCLE ALL THAT APPLY)	WhatsApp 1 Facebook. 2 Telegram. 3 Twitter. 4 Jamii forum 5 Instagram 6 Others (specify)_____97 No response. 98	
1206	Which ones are the most common dating mobile apps that you have used? (CIRCLE ALL THAT APPLY)	Grindr 1 Hornet 2 Tinder 3 I never use dating apps 4 Others……Specify. 88 Don't remember. 97 No response. 98	
Q1207	Have you ever used health related applications before	Yes 1 No 2	⇒Q1208

Q1208	If yes, what application did you use?	_____(mention)	
Q1209	In the past month, have you used your phone for health information?		
Q1210	Do you think use of mobile phone for provision of health information is a good way of reaching people with health information	Yes 1 No 2 Don't know 97 0	

Section 13: Jichunge app: Now I am going to ask you questions about the Jichunge app that you have received

Q1301	How would you rate the *Jichunge* introduction session today?	Very bad 1 Bad 2 Good 3 Very good 4	
Q1302	How well did you understand what was presented?	Very little 1 Little 2 Much 3 Very much 4	
Q1303	How easy or difficult did it seem to use the Jichunge app?	Very difficult 1 Difficult 2 Easy 3 Very easy 4	
Q1304	Which of the jichunge functions do you like the most	Pill reminder 1 Communication with peer educator 2 Communication with doctor. 3 Health education material. 4 Chat with other app users. 5 Try to win prices 6 Gamification - monitor my progress. 6	
Q1305	Which of the *jichunge* functions do you think you will use the most	Pill reminder Y/N Communication with peer educator Y/N Communication with doctor. Y/N Health education material. Y/N Chat with other app users. Y/N Try to win prices Y/N Gamification - monitor my progress Y/N6	

Perceived/ expected benefits/barriers to using Jichunge mHealth App *(asked only to mHealth group)*

Now I would like to ask you about your expectation for *Jichunge app.* Please rate the following statements about the jichunge app on a scale of 1-5 (1= Strongly disagree 2=Disagree 3=Neutral 4=somewhat agree 5=strongly agree

	Statement	**Strongly disagree 1**	**2**	**3**	**4**	**Strongly agree 5**
	Perceived /expected Benefits/barriers					
Q1306	The app will increase the cost a lot of buying internet bundle					
Q1307	The app will consume a lot of your time					

Q1308	The app may expose your sexual behaviors					
Q1309	The app will make your friends know that you are an FSW					
Q1310	The app will be useful for promoting your health					
Q1311	The app will help you understand HIV prevention better					
Q1312	The app will help you stay HIV negative					
Q1313	The app will improve your access to PrEP					
Q1314	The app will help you manage side effects of PrEP					
Q1315	The app will help you to communicate with peer educators					
Q1316	The app will make it convenient for you to communicate with your PrEP provider					
Q1317	The app will help you to get sexual health information and advice					
Q1318	The app will remind you to take PrEP regularly					
Q1319	The app will improve your understanding of PrEP					
Q1320	Your data will be secure when using the Jichunge app					
Q1321	Your regular partner will like that you use the Jichunge app					
Q1322	Your clients will like that you use the Jichunge app					
Q1323	Your family members will like that you use the Jichunge app					
Q1324	It will be easy for you to use the Jichunge app					
Q1325	Your phone has enough space for the Jichunge app					
Q1326	You will be proud to have the *Jichunge* app on my phone					

Time ended: |__|__|

THANK YOU

Dodoso-FSW

Sehemu ya 0: Utambulisho wa utafiti

Na.	Maswali	Majibu	Nenda swali nambari
Q001	Nambari ya utafiti	|__|__|__|__|__|__|__|	
Q002	Nambari ya kuponi	|__|__|__|__|__|__|	
Q003	Mji/Mkoa	Dar es Salaam 1 Tanga 2	⇨ Q004a ⇨ Q004b
Q004a	Manispa	Ilala 1 Kinondoni 2 Temeke 3 Ubungo 4 Kigamboni 5	
Q004b	Wilaya	Tanga 1 Muheza 2 Mkinga 3 Pangani 4 Korogwe 5 Handeni 6 Kilindi 7 Lushoto 8	
Q005	Nambari ya Jichunge	|__|__|__|__|	
Q006	Jina lako la kwanza ni nani? *Maelezo kwa mshiriki: Kumbuka kutumia jina hili hili kipindi kingine utakaposhiriki kwenye utafiti huu.*		
Q007	Jina lako la mwisho/ukoo ni nani? *Maelezo kwa mshiriki: Kumbuka kutumia jina hili hili kipindi kingine utakaposhiriki kwenye utafiti huu.*		
Q008	Namba ya Simu *Tarakimu 10*	|__|__|__|__|__|__|__|__|__|__|	
Q009	Je, ulizaliwa katika mkoa gani? *ANDIKA KWA HERUFI KUBWA*		
Q010	Wewe ni mtoto wa ngapi kuzaliwa?		
Q011	Ulizaliwa tarehe ngapi?	Siku |__|__| Mwezi |__|__| Mwaka |__|__|	
Q012	Tengeneza namba (code) ya utambulisho wa mshiriki kwa kuuliza maswali yafuatayo, kama ulivyomuuliza hapo juu: *1. Mkoa aliozaliwa: Herufi tatu za mwanzo; (kwa mfano: Tanga ni TAN)*		

Na.	Maswali	Majibu	Nenda swali nambari
	2. Wewe ni mtoto wa ngapi kuzaliwa? (Tarakimu 2) Mfano mtoto wa 5 is 05. *3. Tarehe ya kuzaliwa (namba mbili->kwa mfano 9 Juni itakuwa 09)* *4. Mwaka wa kuzaliwa (namba mbili-> kwa mfano 1980 itakuwa 80. (Kama alizaliwa baada ya mwaka 2000: kwa mfano aliyezaliwa mwaka 2001->01.))* Mfano wa kuandika namba ya utambulisho (code): TAN050980		
Q013	Nambari ya mhojaji	|__|__|__|__|	
Q014	Tarehe ya mahojiano	Siku |__|__| Mwezi |__|__| Mwaka |__|__|	
Q015	Muda wa kuanza	|__|__|.|__|__|	

Sehemu ya 1: Mtandao wa Wafanyabiashara ya Ngono (FSW)

Taarifa ya utangulizi (MSOMEE MHOJIWA KWA SAUTI): *Kwanza ningependa kukuuliza maswali kuhusu wanawake wanaofanya biashara ya ngono (FSW) ambao utakuwa unawafahamu, pamoja na mtu aliyekuleta kushiriki kwenye utafiti huu. Napenda kukuhakishia kuwa hakuna yeyote atakayejua utakachonieleza. Kwa hiyo, tafadhali kuwa mkweli.*

Na.	Maswali	Majibu	Nenda swali nambari
Q101	Ni wanawake wangapi unawafahamu wanaofanya biashara ya ngono ambao unawajua majina yao, na wao wanakujua wewe (Wale ambao wanaishi hapa Dar/Tanga, wenye umri wa miaka 18 na zaidi)?	|__|__|__|	
Q102	Ni wangapi kati ya hao (rudia idadi iliyotajwa kwenye jibu la swali Q101) wanawake uliwaona katika kipindi cha mwezi mmoja uliopita?	|__|__|__|	
Q103	Je ungeweza kumpatia kuponi mtu yule aliyekupatia kuponi hii?	Ndio 1 Hapana 2 Hakuna jibu 98	
Q104	Unaelezeaje uhusiano wako na mtu aliyekuleta kwenye utafiti huu, yaani, yule aliyekupa kuponi ya kushiriki kwenye utafiti huu? (usimsomee mshiriki majibu)	Mgeni, mtu niliyekutana nae kwa mara ya kwanza 1 Ninamjua kiasi 2 Rafiki, lakini si wa karibu 3 Rafiki wa karibu, ninamfahamu vizuri sana 4 Ni Mwanafamilia 5 Mwingine (Mtaje)……..…….88 Hakuna jibu 98	
Q105	Mara ngapi unaonana na aliyekupa kuponi hii?	Kila siku 1 Mara nyingi kwa wiki, lakini si kila siku 2	

Na.	Maswali	Majibu	Nenda swali nambari
		Mara moja kwa wiki 3 Chini ya mara moja kwa wiki, lakini zaidi ya mara moja kwa mwezi 4 Mara moja kwa mwezi 5 Chini ya mara moja kwa mwezi 6 Hakuna jibu 98	
Q106	Ni kwa muda gani unamfahamu aliyekupatia kuponi hii? *Miezi mingapi, Ikiwa hajui andika 997 kama jibu*	----------(miezi)	
Q107	Ni sababu gani ya msingi ilikufanya ukubali kushiriki katika utafiti huu? *(Usimsomee majibu, weka alama kwenye jibu moja tu)*	Motisha (marupurupu) 1 Kupata majibu ya vipimo vya magonjwa ya zinaa/ VVU 2 Shinikizo la wenzangu 3 Utafiti unavutia/una umuhimu 4 Nilikuwa na muda wa kutumia 5 Mengineyo (Taja)…… 88 Sijui 97 Hakuna jibu 98	

Sehemu ya 2: Wasifu wa mshiriki/Mhojiwa

Taarifa ya utangulizi (MSOMEE MHOJIWA KWA SAUTI): Ningependa kukuuliza maswali machache kuhusiana *na taarifa zako ikiwa ni pamoja na umri wako, elimu yako, kazi/ajira na kipato chako, n.k.*

Na.	Maswali	Majibu	Nenda swali nambari
Q201	Je, una umri wa miaka mingapi??	----------(Miaka kamili)	
Q202	Umesoma mpaka darasa la ngapi?	Sijasoma 1 Shule ya msingi kiasi 2 Nimemaliza shule ya msingi 3 Sekondari kiasi 4 Nimemaliza elimu ya sekondari 5 Zaidi ya sekondari/chuo 6 Hakuna jibu 98	
Q203	Je, wewe una ndoa ya aina gani?	Sijawahi kuolewa 1 ⇒ Q204 Nimeolewa 2 Ninaishi na mwanaume 3 Tumetengana 4 ⇒ Q204 Tumetalikiana 5 ⇒ Q204 Mjane 6 ⇒ Q204 Hakuna jibu 98 ⇒ Q204	

Na.	Maswali	Majibu	Nenda swali nambari
Q203a	Kama umeolewa au unaishi na mwanaume, je mwenza anajua kuwa unafanya biashara ya ngono?	Ndio 1 Hapana 2 Hakuna jibu 98	
Q204	Ni watu wangapi ambao unaishi nao?	Watu __ __	
Q205	Unaishi na nani kwa sasa?	Naishi peke yangu 1 Naishi na mume wangu 2 Naishi na rafiki yangu wa kiume 3 Naishi na ndugu wengine 4 Naishi na marafiki 5 Wengine (ainisha) ……88 Hakuna jibu 98	
Q206	Je una watoto uliozaa?	Ndio 1 Hapana 2 Hakuna jibu 98	⇨ Q207
Q206a	Wangapi?	----------	
Q206b	Unaishi na yeyote kati yao?	Ndio 1 Hapana 2 Hakuna jibu	
Q207	Zaidi ya biashara ya ngono, unajishughulisha na nini kingine ili kujipatia kipato? *Usimsomee machagulio – Zungushia yote yaliyotajwa*	Sijishughulishi na kitu kingine tofauti na biashara ya ngono 1 Mwajiriwa wa serikali 2 Nimeajiriwa kwenye sekta binafsi 3 Mwanafunzi 4 Nimejiajiri 5 Nyingine (ainisha)……..88 Hakuna jibu 98	
Q208	Kwa jumla kipato chako kwa mwezi ni shillingi ngapi?	_____(TZS)	

Sehemu ya 3: Biashara ya ngono.

Taarifa ya utangulizi (MSOMEE MHOJIWA KWA SAUTI): *Sasa nitakuuliza maswali kuhusu kazi yako ya biashara ya ngono. Baadhi ya maswali ni ya usiri sana. Tafadhari kumbuka kuwa majibu yako yote yatafichwa na ni ya siri.*

Na.	Maswali	Majibu	Nenda swali nambari
Q301	Kwa mara ya kwanza, ulikuwa na umri gani ulipofanya ngono (ukeni au njia ya haja kubwa)? *Ikiwa hajui andika 997*	Miaka_____	
Q302	Kwa mara ya kwanza, ulikuwa na miaka mingapi ulipoanza biashara ya ngono?	Miaka_____	

Na.	Maswali	Majibu	Nenda swali nambari
	Ikiwa hajui andika 997		
Q303	Ni sababu gani ilikufanya ujihusishe na biashara ya ngono? (Inawezekana kuwa na majibu mengi*)*	Nilihitaji fedha ya kusaidia familia 1 Nilihitaji pesa ya kulipa madeni yangu 2 Nilihitaji fedha ya kujikimu 3 Nililazimishwa 4 Napenda kufanya/nafurahia 5 Marafiki/wanafamilia walikuwa wanafanya 6 Nilivutiwa na kipato chake kizuri 7 Nyingine, ainisha _____88 Hakuna jibu 98	
Q304	Ni sehemu gani hasa ambayo unaenda mara kwa mara kutafuta na wateja? *(Chagua moja)*	Pub/Baa/Disco/Club 1 Nyumba ya wageni/hoteli/chumba cha kupanga 2 Nyumba za kujiuzia (danguro) 3 Katika mitaa 4 Kwa njia ya simu 5 Kwa kupitia mtandao 6 Kwa kupitia wakala 7 Nyingineyo (ainisha)_____ 88 Hakuna jibu 98	
Q305	Ni sehemu gani hasa huwa unaenda kufanya ngono na wateja wako?	Chumba cha kupanga (nyumba ya wageni/hoteli) 1 Nyumba za kujiuzia (danguro) 2 Nje/uchocholoni 3 Nyumbani kwangu 4 Nyumbani kwa mteja 5 Nyingine (ainisha)----------88 Hakuna jibu 98	
Q306	Ndani ya miezi 6 iliyopita umewahi kusafiri kwenda mji mwingine au nchi nyingine kufanya biashara ya ngono?	Ndio 1 Hapana 2 Hakuna jibu 98	
Q307	Kwa mara ya mwisho kufanya ngono na mteja wako, ulilipwa shilingi ngapi? (Dodosa upate shilingi za kitanzania) *Ikiwa hajui andika 997*	_____ TZS	
Q308	Jumla ya kipato chako kinachotokana na biashara ya ngono tu ni shilingi gani kwa mwezi (Dodosa upate shilingi za kitanzania) *Ikiwa hajui andika 997*	_____ TZS	
Q309	Je, wewe ni mwanachama wa chama chochote cha wanawake wanaojiuza?	Ndio 1 Hapana 2 Hakuna jibu 98	

Sehemu ya 4: Vitendo vya ngono na wapenzi wa kingono

Taarifa ya utangulizi (MSOMEE MHOJIWA KWA SAUTI): *Sasa nitakuuliza maswali yanayohusiana na wateja wako tofauti pamoja na vitendo vya ngono. Tafadhari jibu kila swali kwa mpenzi wa kudumu (asiyekulipa), na mteja wa mara moja moja (mteja wa kulipa). Mpenzi wa kudumu, kwenye huu utafiti tunamanisha mtu ambaye unafanya naye ngono mara kwa mara na hakulipi.*

Q401a	Je, una wapenzi wa kudumu?	Ndio 1 Hapana 2 Hakuna jibu 98	**-> Kama "hapana" usimuulize maswali yanayofuata ya "Mpenzi wa kudumu"**
Q402a	Unafanya ngono kwa njia ya haja kubwa na wateja wa kulipa?	Ndio Hapana Hakuna jibu	**Kama "hapana" ruka maswali yote yanayohusiana na ngono kwa njia ya haja kubwa na "mteja wa kulipa"**
Q401b	Unafanya ngono kwa njia ya haja kubwa na mpenzi wa kudumu?	Ndio Hapana Hakuna jibu	**Kama "hapana" ruka maswali yote yanahusiana na ngono kwa njia ya haja kubwa na "mpenzi wa kudumu"**

Na.		**Mpenzi wa kudumu-asiyelipa**	**Wateja wa kulipa**
Q401c Q402b	Ndani ya mwezi mmoja uliopita: ni wapenzi wangapi ulifanya nao ngono kwa njia ya ukeni? *Ikiwa hajui andika 997*	-------- *(andika idadi)*	-------- *(andika idadi)*
Q401d Q402c	Ndani ya mwezi mmoja uliopita: ni wapenzi wangapi ulifanya nao ngono kwa njia ya haja kubwa? *Ikiwa hajui andika 997*	-------- *(andika idadi)*	-------- *(andika idadi)*
Q402d	Siku ya mwisho ulipofanya kazi; Ni wateja wangapi ulifanya nao ngono kwa njia ya ukeni? *Ikiwa hajui andika 997*		-------- *(andika idadi)*
Q402e	Siku ya mwisho ulipofanya kazi; Ni wateja wangapi ulifanya nao ngono kwa njia ya haja kubwa? *Ikiwa hajui andika 997*		-------- *(andika idadi)*
Q401e Q402f	Je, mara ya mwisho ulipofanya ngono kwa njia ya uke na [mpenzi] ulitumia kondomu	Ndio 1 Hapana 2 Sikumbuki 97 Hakuna jibu 98	Ndio 1 Hapana 2 Sikumbuki 97 Hakuna jibu 98
Q401f	Kama hukutumia kondomu mara ya mwisho ulipofanya ngono kwa njia ya uke, je ulijua kuwa [mpenzi] anatumia dawa za VVU?	Ndio 1 Hapana 2 Sikumbuki 97 Hakuna jibu 98	Usimuulize kwa wateja wake

Na.		Mpenzi wa kudumu-asiyelipa	Wateja wa kulipa
Q401g Q402g	Je, mara ya mwisho ulipofanya ngono kwa njia ya haja kubwa na [*mpenzi*] ulitumia kondomu?	Ndio 1 Hapana 2 Sikumbuki 97 Hakuna jibu 98	Ndio 1 Hapana 2 Sikumbuki 97 Hakuna jibu 98
Q401h	Kama hukutumia kondomu mara ya mwisho ulipofanya ngono kwa njia ya haja kubwa, ulijua kuwa [mpenzi] yupo kwenye dawa za VVU?	Ndio 1 Hapana 2 Sikumbuki 97 Hakuna jibu 98	Usimuulize kwa wateja wake
Q401i Q402h	Je, mara ya mwisho ulipofanya ngono kwa njia ya haja kubwa na [*mpenzi*], ulitumia kilainishi chochote?	Ndio 1 Hapana 2 Sikumbuki 97 Hakuna jibu 98	Ndio 1 Hapana 2 Sikumbuki 97 Hakuna jibu 98
Q401j Q402i	<u>Ndani ya mwezi mmoja uliopita: je,</u> uliwahi kukataa kufanya ngono na [mpenzi] kwa sababu hakukubali kutumia kondomu?	Ndio 1 Hapana 2 Sikumbuki 97 Hakuna jibu 98	Ndio 1 Hapana 2 Sikumbuki 97 Hakuna jibu 98
Q401l Q402j	<u>Ndani ya mwezi mmoja uliopita:</u> Je, ulikubali kufanya ngono bila kondomu kwa sababu ya kulipwa zaidi?		Ndio 1 Hapana 2 Sikumbuki 97 Hakuna jibu 98
Q401m Q402k	<u>Ndani ya mwezi mmoja uliopita:</u> Je, ulikubali kufanya ngono kwa njia ya haja kubwa kwa sababu ya kulipwa zaidi (ukilinganisha na kufanya ngono kwa njia ya uke)?		Ndio 1 Hapana 2 Sikumbuki 97 Hakuna jibu 98

Sehemu ya 5: Unyanyapaa, vurugu na kufungwa kwa wanawake wanaofanya biashara ya ngono (viambishi vya muundo)

Taarifa ya utangulizi (MSOMEE MHOJIWA KWA SAUTI): *Sasa nitakuuliza baadhi ya maswali kuhusu ugumu ambao unaweza ukawa umeupitia na mitazamo hasi ambayo baadhi ya wafanyabiashara wa ngono wanaweza wakawa nayo.Taarifa hizi haziwakilishi hisia au mawazo ya mhojaji.*

Na.	Maswali	Majibu	Nenda swali nambari
Q501	Ni kama mara ngapi umekuwa ukibaguliwa/kutendewa vibaya na familia, marafiki au watu wengine kwenye jamii kwa sababu wewe ni mfanyabiashara ya ngono?	Sijawahi 1 Chini ya kila mwezi 2 Kila mwezi 3 Kila wiki 4 Kila siku au angalau kila siku 5 Hakuna jibu 98	
Q502	Umeshawahi kufanyiwa unyanyasaji wa kimwili (kama kupigwa) ndani ya miezi 12 iliyopita	Ndio 1 Hapana 2 Sikumbuki 97 Hakuna jibu 98	 ⇒ Q504 ⇒ Q504 ⇒ Q504
Q503	Nani alikunyanyasa kimwili? *(Zungushia duara yote ambayo yametajwa)*	Mteja wa wakati mmoja 1 Mteja wa mara kwa mara 2 Mpenzi wa kudumu/rafiki wa kiume/rafiki wa kike 3 Mwanafamilia 4	

Na.	Maswali	Majibu	Nenda swali nambari
		Mfanyakazi mwenzako 5 Polisi 6 Mwingine (ainisha) _____88 Hakuna jibu 98	
Q504	Katika kipindi cha miezi 12 iliyopita, umewahi kulazimishwa kufanya mapenzi?	Ndio 1 Hapana 2 Sikumbuki 97 Hakuna jibu 98	 ⇨ Q507 ⇨ Q507 ⇨ Q507
Q505	Ni mara ngapi katika kipindi cha miezi 12 iliyopita ulilazimishwa kufanya ngono? *Ikiwa hajui andika 997*	_____(Namba)	
Q506	Nani alikulazimisha kufanya ngono? *(Zungushia duara yote ambayo yametajwa)*	Mteja wa wakati mmoja 1 Mteja wa mara kwa mara 2 Mpenzi/rafiki wa kiume/rafiki wa kike 3 Mwanafamilia 4 Mfanyakazi mwenzangu 5 Polisi 6 Mwingine (mtaje), _____88 Hakuna jibu 98	
Q507	Katika kipindi cha miezi 12 iliyopita umewahi kukamatwa na polisi?	Ndio 1 Hapana 2 Hakuna jibu 98	 ⇨ Q509
Q508.	Mara ya mwisho ulipokamatwa na polisi ulikamatwa kwa kosa gani?	kujiuza 1 kutangatanga 2 kumshambulia mtu 3 mapenzi ya jinsia moja 4 mengine_____88 hakuna jibu 98	
Sasa naenda kuongelea juu ya unavyohisi/jisikia kama mfanyabiashara ya ngono. Tafadhali niambie kama hukubaliani kabisa, hukubaliani, unakubaliana, au unakubaliana kabisa kwa taarifa zifuatazo.			
Q509	Kufanya kazi ya biashara ya ngono kunakufanya ujihisi kama mtu mbaya	Nakubaliana kabisa 1 Nakubaliana 2 Sikubaliani 3 Sikubaliani kabisa 4	
Q510.	Unahisi kama haupo vizuri kama watu wengine kwa sababu ya kuwa mfanyabiashara ya ngono	Nakubaliana kabisa 1 Nakubaliana 2 Sikubaliani 3 Sikubaliani kabisa 4	
Q511	Mitazamo ya watu kuhusu biashara ya ngono inakufanya ujihisi vibaya	Nakubaliana kabisa 1 Nakubaliana 2 Sikubaliani 3 Sikubaliani kabisa 4	
Q512	Unajihisi ni mkosaji kwa sababu ni mfanyabiashara ya ngono	Nakubaliana kabisa 1 Nakubaliana 2 Sikubaliani 3	

Na.	Maswali	Majibu	Nenda swali nambari
		Sikubaliani kabisa 4	
Q513	Unahisi kuaibika kwa sababu ya biashara ya ngono	Nakubaliana kabisa 1 Nakubaliana 2 Sikubaliani 3 Sikubaliani kabisa 4	
Q514	Ni rahisi kukwepa urafiki kuliko hofu ya kuwaambia watu wengine kuwa ni mfanyabiashara ya ngono	Nakubaliana kabisa 1 Nakubaliana 2 Sikubaliani 3 Sikubaliani kabisa 4	
Q515	Unajihisi huna thamani kabisa kwa sababu ni mfanyabiashara ya ngono	Nakubaliana kabisa 1 Nakubaliana 2 Sikubaliani 3 Sikubaliani kabisa 4	
Q516	Unajihisi umeleta usumbufu sana kwa familia yako kwa sababu ni mfanyabiashara ya ngono	Nakubaliana kabisa 1 Nakubaliana 2 Sikubaliani 3 Sikubaliani kabisa 4	
Q517	Unaipenda kazi yako kama mfanyabiashara ya ngono	Nakubaliana kabisa 1 Nakubaliana 2 Sikubaliani 3 Sikubaliani kabisa 4	
Q518	Unajisikia vizuri kwa kuwa mfanyabiashara ya ngono	Nakubaliana kabisa 1 Nakubaliana 2 Sikubaliani 3 Sikubaliani kabisa 4	
Q519	Unajisikia vizuri kuwambia watu wengine kuwa wewe ni mfanyabiashara ya ngono	Nakubaliana kabisa 1 Nakubaliana 2 Sikubaliani 3 Sikubaliani kabisa 4	
Q520	Unaiona biashara ya ngono kama kazi zingine tu	Nakubaliana kabisa 1 Nakubaliana 2 Sikubaliani 3 Sikubaliani kabisa 4	
Q521	Unastahili heshima ukiwa kama mfanyabiashara ya ngono	Nakubaliana kabisa 1 Nakubaliana 2 Sikubaliani 3 Sikubaliani kabisa 4	

Sehemu ya 6: Elimu na upatikanji wa huduma za Afya za VVU

Taarifa ya utangulizi (SOMA KWA SAUTI KWA MSHIRIKI): Katika *sehemu hii, nitasoma baadhi ya taarifa kadhaa juu ya VVU na UKIMWI na upatikanaji wa huduma husika. Taarifa zingine ni za kweli na zingine ni za uongo. Tafadhali niambie kama ni kweli au si kweli kwa kila taarifa.*

Na.	Maswali	Majibu	Nenda swali nambari
Q601	Kufanya mapenzi na mpenzi mmoja tu mwaminifu asiye na maambukizi hupunguza hatari ya kuambukizwa VVU	Kweli 1 Si kweli 2 Sijui 97 Hakuna jibu 98	
Q602	Mtu anaweza kuonekana ana afya nzuri lakini akawa na maambukizi ya VVU	Kweli 1 Si kweli 2 Sijui 97 Hakuna jibu 98	
Q603	Kutumia kondomu kila wakati unapofanya mapenzi kwa njia ya haja kubwa kunapunguza uwezekano wa kuambukizwa VVU	Kweli 1 Si kweli 2 Sijui 97 Hakuna jibu 98	
Q604	Matumizi ya ARV kwa watu wanaoishi na VVU yanaweza kuzuia maambukizi ya VVU	Kweli 1 Si kweli 2 Sijui 97 Hakuna jibu 98	
Q605	VVU vinaweza kuenezwa na mbu au kuumwa na wadudu wengine	Kweli 1 Si kweli 2 Sijui 97 Hakuna jibu 98	
Q606	Je, umeshawahi kupimwa VVU kabla ya kujiunga na utafiti huu?	Ndio 1 Hapana 2 Hakuna jibu 98	
Q607	Je, unaweza kupata kondomu ya kiume kila unapohitaji?	Ndio 1 Hapana 2 Hakuna jibu 98	⇨Q609 ⇨Q609
Q608	Kwa nini huwezi kupata kondomu ya kiume kila unapohitaji? *Majibu yanaweza kuwa zaidi ya moja (Usimsomee majibu)*	Ni gharama sana 1 Hazipatikani 2 Maeneo ya kuzipata yapo mbali sana 3 Aibu ya kununua kondomu 4 Sijui pakuipata 5 Mambo hutokea haraka sana 6 Sihitaji kondomu 7 Nyingine, itaje_____88 Hakuna jibu 98	
Q609	Kwa kawaida huwa unapata wapi kondomu ya kiume unapohitaji?	Kituo cha afya 1 Duka la dawa 2 Madukani 3 Kutoka kwenye taasisi/mradi 4 Kutoka kwa marafiki 5 Nyingine, itaje_____88 Hakuna jibu 98	

Na.	Maswali	Majibu	Nenda swali nambari
Q610	Je, unaweza kupata kilainishi kila unapohitaji	Ndio 1 Hapana 2 Hakuna jibu 98	⇒Q612 ⇒Q612
Q611	Kwa nini huwezi kupata kilainishi kila unapohitaji? *Majibu yanaweza kuwa zaidi ya moja* *(Usisomee majibu)*	Kina gharama Sana 1 Hakipatikani 2 Maeneo ya kukipata yapo mbali 3 Aibu ya kununua kilainishi 4 Sijui pa kukipata 5 Mambo hutokea haraka sana 6 Sihitaji kilainishi 7 Nyngine, Itaje_____88 Hakuna jibu 98	
Q612	Kwa kawaida huwa unapata wapi kilainishi unapohitaji? *(Zungushia yote yaliyotajwa)*	Kituo cha afya 1 Duka la dawa 2 Madukani 3 Kutoka kwenye taasisi/mradi 4 Kutoka kwa marafiki 5 Nyingine, itaje_____88 Hakuna jibu 98	
Q613	Ndani ya miezi 6 iliyopita, umewahi kukutwa na ugonjwa wa zinaa?	Ndio 1 Hapana 2 Hakuna jibu 98	
Q614	Je, kwa sasa kuna dawa yoyote unayotumia kwa matibabu mbali na vidonge vya PrEP?	Ndio 1 Hapana 2 Hakuna jibu 98	

Sehemu ya 7: Taarifa juu ya dawa za kuzuia maambukizi (1), Vichocheo (2), ustadi wa tabia (3) (uwezo binafsi)

Maarifa/taarifa juu ya PrEP

Taarifa ya utangulizi (MSOMEE MHOJIWA KWA SAUTI): *Baadhi ya taarifa zifuatazo kuhusu PrEP ni za kweli na zingine si za kweli. Ikiwa huna uhakika na jibu, tafadhali usifikirie, lakini jibu "sijui".*

Na.	Maswali	Majibu	Nenda swali nambari
Q701	PrEP hutoa kinga zidi ya maambukizi ya magonjwa yote ya zinaa	Ni kweli 1 Si kweli 2 Sijui 97 Hakuna jibu 98	
Q702	Madhara ya muda mfupi ya PrEP yanaweza kuwa kichefuchefu na kizunguzungu	Ni kweli 1 Si kweli 2 Sijui 97 Hakuna jibu 98	
Q703	Haupaswi kutumia PrEP kama haujui hali yako ya VVU	Ni kweli 1 Si kweli 2	

Na.	Maswali	Majibu	Nenda swali nambari
		Sijui 97 Hakuna jibu 98	
Q704	Ikiwa hutumii PrEP kama ulivyoandikiwa na wataalamu wa afya, unaweza usiwe na dawa ya kutosha mwilini mwako ili kuzuia VVU	Ni kweli 1 Si kweli 2 Sijui 97 Hakuna jibu 98	
Q705	PrEP inaweza kutumiwa na watu ambao tayari wana VVU	Ni kweli 1 Si kweli 2 Sijui 97 Hakuna jibu 98	
Q706	Ni lazima uhudhurie kliniki ulizopangiwa pamoja na kupima VVU ukiwa unatumia PrEP	Ni kweli 1 Si kweli 2 Sijui 97 Hakuna jibu 98	
Q707	Inashauriwa kutumia kondomu hata kama unatumia PrEP	Ni kweli 1 Si kweli 2 Sijui 97 Hakuna jibu 98	
Q708	Wanawake tu ndo wanatakiwa watumie PrEP katika mahusiano ya kimapenzi	Ni kweli 1 Si kweli 2 Sijui 97 Hakuna jibu 98	

Motisha/Vichocheo vya PrEP

Taarifa ya utangulizi (MSOMEE MHOJIWA KWA SAUTI): *Tafadhari tueleze ni kwa kiasi gani unakubaliana au hukubaliani na mawazo yalipo katika kila sentensi*

Na.	Maswali	Majibu	Nenda swali nambari
Q709	Unafikiri kuna uwezekano kiasi gani wa wewe kuambukizwa VVU?	Kiasi kikubwa 1 Kiasi cha wastani 2 Kiasi kidogo 3 Hakuna uwezekano wowote 4 Sijui 97 Hakuna jibu 98	
Q710	Umekuwa na wasiwasi juu ya kupata VVU	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana 4 Nakubaliana kabisa 5	
Q711	Utakuwa na wasiwasi kidogo juu ya VVU endapo utakuwa unatumia PrEP	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana 4 Nakubaliana kabisa 5	
Q712	Ni muhimu usipate VVU	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana 4 Nakubaliana kabisa 5	

Na.	Maswali	Majibu	Nenda swali nambari
Q713	Ngono itakuwa poa wakati unatumia PrEP	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana 4 Nakubaliana kabisa 5	
Q714	Unapata ugumu kutumia kondomu kila wakati	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana 4 Nakubaliana kabisa 5	
Q715	Utahisi una uwezo zaidi wa kudhibiti afya yako ya kimapenzi wakati unatumia PrEP	Sikubaliani kabisa 1 Sikubalini 2 Sikubali wala sikatai 3 Nakubaliana 4 Nakubaliana kabisa 5	
Q716	Kutumia PrEP ni salama	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai3 Nakubaliana 4 Nakubaliana kabisa 5	
Q717	Unapokuwa unatumia PrEP utakuwa na wasiwasi juu ya madhara yanayoweza kutokana na PrEP	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana 4 Nakubaliana kabisa 5	
Q718	Wapenzi wako wa kudumu watakuunga mkono endapo watagundua kuwa unatumia PrEP	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana 4 Nakubaliana kabisa 5	
Q719	Utakuwa na wasiwasi endapo wateja wako watagundua kuwa unatumia PrEP	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana 4 Nakubaliana kabisa 5	
Q720	Wengi wa wanawake wanaojiuza katika jamii yako wanatumia au wanafikiria kuanza kutumia PrEP	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana 4 Nakubaliana kabisa 5	

Unyanyapaa kwa watumiaji wa PrEP Taarifa ya utangulizi: (MSOMEE MUHOJIWA KWA SAUTI):
Katika sehemu zifuatazo tutawasilisha taarifa kadhaa juu ya jinsi unavyofikiria juu ya matumizi ya PrEP
Majibu: Sikubaliani kabisa, Sikubaliani, Sikubali wala sikatai, Nakubaliana, Nakubaliana kabisa

Na.	Maswali	Majibu	Nenda swali nambari
Q721	Rafiki zangu wangeweza kunidharau ikiwa wangegundua nilikuwa natumia PrEP	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3	

Na.	Maswali	Majibu	Nenda swali nambari
		Nakubaliana 4 Nakubaliana kabisa 5	
Q722	Familia yangu ingenidharau ikiwa ingegundua nilikuwa natumia PrEP	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana 4 Nakubaliana kabisa 5	
Q723	Watu wangekuwa na wasiwasi na mimi ikiwa wangegundua kuwa nilitumia PrEP	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana 4 Nakubaliana kabisa 5	
Q724	Watu wangenikwepa ikiwa wangegundua kuwa nilitumia PrEP	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana 4 Nakubaliana kabisa 5	
Q725	Ningekuwa na wasiwasi kwamba watu watawaambia wengine kuwa ninatumia PrEP.	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana 4 Nakubaliana kabisa 5	
Q726	Watu wangedhani kwamba ninafanya mapenzi na watu wengi tofauti wakati natumia PrEP	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana 4 Nakubaliana kabisa 5	
Q727	Watu wangefikiria kuwa napenda kufanya ngono za ajabu ajabu wakati natumia PrEP	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana 4 Nakubaliana kabisa 5	
Q728	PrEP inakusudiwa zaidi kwa watu ambao hawawezi kutumia kondomu	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana 4 Nakubaliana kabisa 5	
Q729	PrEP ni kitu kinachotumiwa zaidi na watu ambao hawana pesa	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana 4 Nakubaliana kabisa 5	
Q730	Kama ningeanzisha mada ya matumizi ya PrEP kwa mwenzi wangu, angefikiria kuwa ninafanya mapenzi hatarishi na watu wengine	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana 4 Nakubaliana kabisa 5	

Ujuzi wa kitabia juu ya PrEP/Uwezo binafsi

(Endelea moja kwa moja kutoka kwa maswali ya hapo juu, badilisha tu machagulio ya majibu):

Taarifa ya utangulizi: (MSOMEE MUHOJIWA KWA SAUTI): Sasa nitakusomea Taarifa na ningekuomba uchague alama kutoka 1 hadi 5 ambapo (1 = Sijiamini kabisa,2 = Najiamini kidogo tu 3 =Najiamini kiasi 4 = Najiamini 5 = Najiamini sana)

Na.	Maswali	Majibu	Nenda swali nambari
Q731	Unajiamini kiasi gani kwamba utaweza kutumia PrEP kila siku?	Sijiamini kabisa 1 Najiamini kidogo 2 Najiamini kiasi 3 Najiamini 4 Najiamini sana 5	
Q732	Una imani kiasi gani kuwa unaweza kujazia PrEP kabla hujamalizia ulizonazo?	Sijiamini kabisa 1 Najiamini kidogo 2 Najiamini kiasi 3 Najiamini 4 Najiamini sana 5	
Q733	Unajiamini kwa kiasi gani kwamba unaweza kuendelea na dozi yako ya PrEP hata ikiwa kuhudhuria tarehe ulizopangiwa kwenda kliniki ni karaha kubwa?	Sijiamini kabisa 1 Najiamini kidogo 2 Najiamini kiasi 3 Najiamini 4 Najiamini sana 5	
Q734	Unajiamni kwa kiasi gani kwamba utajadiliana na mhudumu wa afya tatizo lolote utakalokuwa nalo linalotokana na kutumia PrEP?	Sijiamini kabisa 1 Najiamini kidogo 2 Najiamini kiasi 3 Najiamini 4 Najiamini sana 5	
Q735	Unajiamni kwa kiasi gani kwamba utahudhuria kliniki ulizopangiwa kwa ajili ya ufuatiliaji wa matumizi ya PrEP??	Sijiamini kabisa 1 Najiamini kidogo 2 Najiamini kiasi 3 Najiamini 4 Najiamini sana 5	
Q736	Unajiamni kwa kiasi gani kwamba utaendelea na matumizi ya PrEP hata kama utapata baadhi ya madhara yatokanayo na matumizi ya PrEP (mf; kichefuchefu)	Sijiamini kabisa 1 Najiamini kidogo 2 Najiamini kiasi 3 Najiamini 4 Najiamini sana 5	

Sehemu ya 8: Matumizi ya Pombe (AUDIT)

Taarifa ya utangulizi (MSOMEE MHOJIWA KWA SAUTI): *Sasa napenda kukuuliza baadhi ya maswali juu ya matumizi ya pombe. Tafadhali kumbuka kuwa majibu yako yatabaki kuwa ya siri.*

Na.	Maswali	Majibu	Nenda swali nambari
Q801	Je, umewahi kunywa pombe ndani ya mwaka mmoja uliopita?	Ndio 1 Hapana 2 Hakuna jibu 98	⇒ Q901
Q802	Je, kwa wastani mwaka uliopita ni mara ngapi ulitumia pombe?	Kila mwezi au chini ya mwezi 1 Mara 2 hadi 4 kwa mwezi 2 Mara 2 hadi 3 kwa wiki 3 4 au Zaidi kwa wiki 4	

Na.	Maswali	Majibu	Nenda swali nambari
Q803	Je, kwa siku yako ya kawaida unakunywa pombe kiasi gani?	1 au 2 1 3 au 4 2 5 au 6 3 7 au 9 4 10 au zaidi 5	
Q804	Kwa mwaka uliopita ni mara ngapi unatumia vinywaji sita au zaidi (chupa sita za bia ndogo au chupa 4 za bia kubwa au glasi 4 za wine) kwa wakati mmoja?	Haijawahi kutokea 1 Chini ya kila mwezi 2 Kila mwezi 3 Kwa wiki 4 Kila siku au karibu kila siku 5	
Q805	Mara ngapi katika mwaka uliopita uligundua hukuweza kuacha kunywa mara ukishaanza?	Haijawahi kutokea 1 Chini ya kila mwezi 2 Kila mwezi 3 Kwa wiki 4 Kila siku au karibu kila siku 5	
Q806	Mara ngapi katika mwaka uliopita ulishindwa kufanya unavyotarajiwa kutoka kwako kwa sababu ya kunywa?	Haijawahi kutokea 1 Chini ya kila mwezi 2 Kila mwezi 3 Kwa wiki 4 Kila siku au karibu kila siku 5	
Q807	Mara ngapi katika mwaka uliopita ulihitaji kinywaji cha kwanza asubuhi ili kuweza kuendelea na shughuli zako baada ya kunywa sana siku iliyopita (jana)?	Haijawahi kutokea 1 Chini ya kila mwezi 2 Kila mwezi 3 Kwa wiki 4 Kila siku au karibu kila siku 5	
Q808	Mara ngapi katika mwaka uliopita ulijihisi kuwa na hatia au kujilaumu baada ya kunywa?	Haijawahi kutokea 1 Chini ya kila mwezi 2 Kila mwezi 3 Kwa wiki 4 Kila siku au karibu kila siku 5	
Q809	Mara ngapi katika mwaka uliopita hukuweza kukumbuka kilichotendeka usiku uliopita kwa sababu ulikunywa?	Haijawahi kutokea 1 Chini ya kila mwezi 2 Kila mwezi 3 Kwa wiki 4 Kila siku au karibu kila siku 5	
Q810	Je, umejeruhiwa au mtu mwingine kujeruhiwa kwa sababu ya kunywa kwako?	Hapana 1 Ndiyo, lakini si kwa mwaka uliopita 2 Ndiyo kwa mwaka uliopita 3	
Q811	Je, ndugu yako au rafiki yako au daktari au mhudumu wa afya mwingine ameguswa na kunywa kwako au kupendekeza upunguze kunywa kwako?	Hapana Ndio, lakini si kwa mwaka uliopita Ndio kwa mwaka uliopita	
Q812	Ulikuwa umekunywa pombe mara ya mwisho ulipofanya ngono na mteja wako?	Ndio 1 Hapana 2 Hakuna jibu 98 Sikumbuki 97	

Sehemu ya 9: Matumizi ya madawa ya kulevya

Taarifa ya utangulizi (MSOMEE MHOJIWA KWA SAUTI): *Sasa napenda nikuulize baadhi ya maswali kuhusu matumizi ya madawa. Tafadhali kumbuka kuwa majibu yako yatabaki kuwa siri.*

Na.	Maswali	Majibu	Nenda swali nambari
Q901a	Je, umewahi kutumia madawa ya kulevya (dawa haramu, pamoja na bangi) zaidi ya zile zinazohitajika kwa sababu ya kimatibabu?	Ndio 1 Hapana 2 Hakuna jibu 98	⇒ Q1001
Q901b	Ni madawa ya aina gani ulishawahi kutumia? *Majibu yanaweza kuwa zaidi ya moja (MSOMEE majibu kwa sauti)*	Bangi 1 Miraa 2 Heroini 3 Kokeni 4 Amfetamini 5 Vya kuvuta/kunusa (dawa ya viatu, gundi, petrol) 6 Benzodazepines (Diazepam, rivotril, Xanor) 7 Ketamine. 8 Crystal meth. 9 Mephedrone. 10 Nyingine----------(Zitaje) 88 Hakuna jibu 98	
Q902	Je, ushawahi kujidunga madawa ya kulevya?	Ndio 1 Hapana 2 Hakuna jibu 98	⇒ Q904
Q903a	Umeshawahi kujidunga madawa katika kipindi cha miezi sita (6) iliyopita?	Ndiyo 1 Hapana 2 Hakuna jibu 98	
Q903b	Ni madawa gani ulijidunga? *Majibu yanaweza kuwa zaidi ya moja*	Heroini 1 Kokeni 2 Amphetamine 3 Mengine----------(ainisha) 88	
Q904	Je umeshawahi kutumia madawa ya kulevya, (pamoja na bangi) zaidi ya ulivyokuwa unahitaji?	Ndiyo1 Hapana 2 Hakuna jibu 98	
Q905	Je umeshawahi kuwaza au kuwa na mpango wa kuacha kutumia madawa ya kulevya (pamoja na bangi)	Ndiyo1 Hapana 2 Hakuna jibu 98	
Q906	Mara ya mwisho ulivyofanya mapenzi na mteja, ulitumia dawa yeyote (Pamoja na bangi)?	Ndio 1 Hapana 2 Sikumbuki 97 Hakuna jibu 98	

Section ya 10: Msaada wa kijamii: Maswali ya kudodosa msaada wa kijamii (Duke–UNC Functional Social Support Questionnaire (FSSQ)

Taarifa ya utangulizi (MSOMEE MHOJIWA KWA SAUTI): *Hapa kuna orodha ya vitu ambavyo watu wengine hutufanyia au kutupa ambavyo vinaweza kusaidia. Tafadhali msomee kila taarifa kwa uangalifu. Tafadhali toa alama kwa taarifa zifuatazo kuhusu unavyotamani kwa kiwango cha 1-5 ambapo (1 = Kidogo sana kuliko ambavyo ningetamani 2 = Kidogo ya ambavyo ningetamani 3 = Kiasi, ingawa ningetamani zaidi 4 = Karibu na vile navyotamani 5 = Kama vile ninavyotamani)*

Na	Maswali	Majibu	Nenda swali nambari
Q1001	Una watu wanaojali yanayokupata	Kidogo sana kuliko ambavyo ningetamani 1 Kidogo kuliko amabvyo ningetamani 2 Kiasi, ingawa ningetamani zaidi 3 Karibu na vile ninavyotamani 4 Kama vile ninavyotamani 5	
Q1002	Unapata upendo na mapenzi	Kidogo sana kuliko ambavyo ningetamani 1 Kidogo kuliko ambavyo ningetamani 2 Kiasi, ingawa ningetamani zaidi 3 Karibu na vile ninavyotamani 4 Kama vile ninavyotamani 5	
Q1003	Unapata nafasi ya kuzungumza na mtu juu ya shida zako za kazini au nyumbani	Kidogo sana kuliko ambavyo ningetamani 1 Kidogo kuliko ambavyo ningetamani 2 Kiasi, ingawa ningetamani zaidi 3 Karibu na vile ninavyotamani 4 Kama vile ninavyotamani 5	
Q1004	Unapata nafasi ya kuzungumza na mtu unayemuamini juu ya shida zako za kibinafsi au za familia	Kidogo sana kuliko ambavyo ningetamani 1 Kidogo kuliko ambavyo ningetamani 2 Kiasi, ingawa ningetamani zaidi 3 Karibu na vile ninavyotamani 4 Kama vile ninavyotamani 5	
Q1005	Unapata nafasi ya kuzungumzia juu ya masula ya kifedha	Kidogo sana kuliko ambavyo ningetamani 1 Kidogoya kuliko ambavyo ningetamani 2 Kiasi, ingawa ningetamani zaidi 3 Karibu na vile ninavyotamani 4 Kama vile ninavyotamani 5	
Q1006	Unapata mialiko ya kutoka na kufanya vitu na watu wengine	Kidogo sana kuliko ambavyo ningetamani 1 Kidogo kuliko ambavyo ningetamani 2 Kiasi, ingawa ningetamani zaidi 3 Karibu na vile ninavyotamani 4 Kama vile ninavyotamani 5	
Q1007	Unapata ushauri kuhusu vitu muhimu katika maisha	Kidogo sana kuliko ambavyo ningetamani 1 Kidogo kuliko ambavyo ningetamani 2 Kiasi, ingawa ningetamani zaidi 3 Karibu na vile ninavyotamani 4 Kama vile ninavyotamani 5	
Q1008	Unapata msaada wakati unapoumwa kitandani	Kidogo sana kuliko ambavyo ningetamani 1 Kidogo kuliko ambavyo ningetamani 2 Kiasi, ingawa ningetamani zaidi 3 Karibu na vile ninavyotamani 4 Kama vile ninavyotamani 5	

Sehemu ya 11: Upatikani na kuridhika na huduma za afya

Taarifa ya utangulizi (MSOMEE MHOJIWA KWA SAUTI): *Nitakuuliza maswali kuhusu upatikanaji wa huduma za afya kwako na mara ya mwisho ulipokwenda kutafuta huduma.*

Na.	Maswali	Coding categories	Nenda swali nambari
Q1101	Kwa ujumla, unaweza kusema kuwa afya yako ni…	Bora Zaidi 1 Vizuri sana 2 Vizuri 3 Kawaida 4 Dhaifu 5	
Q1102	Katika wiki mbili zilizopita, ni mara ngapi umekuwa ukisumbuliwa na shida zifuatazo ?: *Maslahi kidogo au raha katika kufanya mambo*	Hakuna kabisa 1 Siku kadhaa 2 Zaidi ya nusu ya siku 3 Karibia kila siku 4	
Q1103	Katika wiki mbili zilizopita, ni mara ngapi umekuwa ukisumbuliwa na shida zifuatazo? Kujisikia vibaya, kusononeka au kukosa tumaini	Hakuna kabisa 1 Siku kadhaa 2 Zaidi ya nusu ya siku 3 Karibia kila siku 4	
Q1104	Katika wiki mbili zilizopita, ni mara ngapi umekuwa ukisumbuliwa na shida zifuatazo: Kuhisi uwoga, wasiwasi au kukata tamaa	Hakuna kabisa 1 Siku kadhaa 2 Zaidi ya nusu ya siku 3 Karibia kila siku 4	
Q1105	Katika wiki mbili zilizopita, ni mara ngapi umekuwa ukisumbuliwa na shida zifuatazo: Kutokuwa na uwezo wa kuacha au kudhibiti wasiwasi?	Hakuna kabisa 1 Siku kadhaa 2 Zaidi ya nusu ya siku 3 Karibia kila siku 4	
Q1106	Mara ya mwisho ulipokuwa na tatizo la kiafya, ulienda wapi?	Duka la dawa 1 Kituo cha afya cha serikali 2 Kituo cha afya cha binafsi 3 Outreach 4 Mwelimishjia rika/NGO 5 Nilijitibu mwenyewe nyumbani 6 Kwa Mganga wa jadi/kienyeji 7 Sikufanya chochote, sikwenda kokote 8 Nyingine, zitaje_____ 98 Sikumbuki 97 Hakuna jibu 98	
Q1107	Je, umeshawahi kupata matatizo ya kifedha kutokana na kulipia huduma za afya?	Ndio 1 Hapana 2 Sikumbuki 97 Hakuna jibu 98	
Q1108	Mara ya mwisho ulipoenda kwenye kituo cha afya kupata huduma, ulihisi ni kwa kiwango gani kwamba mtoa huduma wa afya alikupa ushirikiano?	Hakutoa ushirikiano kabisa 1 Hakutoa ushirikiano 2 Alitoa ushirikiano 3 Alitoa ushirikiano sana 4 Hakuna jibu 98	
Q1109	Mara ya mwisho ulipoenda kwenye kituo cha afya kupata huduma, ni kwa kiwango gani uliridhika na jinsi ulivyotibiwa kwa ujumla?	Sikuridhika kabisa 1 Sikuridhika 2 Niliridhika 3 Niliridhika sana 4	

Na.	Maswali	Coding categories	Nenda swali nambari
Q1101	Kwa ujumla, unaweza kusema kuwa afya yako ni…	Bora Zaidi 1 Vizuri sana 2 Vizuri 3 Kawaida 4 Dhaifu 5	
Q1102	Katika wiki mbili zilizopita, ni mara ngapi umekuwa ukisumbuliwa na shida zifuatazo ?: *Maslahi kidogo au raha katika kufanya mambo*	Hakuna kabisa 1 Siku kadhaa 2 Zaidi ya nusu ya siku 3 Karibia kila siku 4	
Q1103	Katika wiki mbili zilizopita, ni mara ngapi umekuwa ukisumbuliwa na shida zifuatazo? Kujisikia vibaya, kusononeka au kukosa tumaini	Hakuna kabisa 1 Siku kadhaa 2 Zaidi ya nusu ya siku 3 Karibia kila siku 4	
Q1104	Katika wiki mbili zilizopita, ni mara ngapi umekuwa ukisumbuliwa na shida zifuatazo: Kuhisi uwoga, wasiwasi au kukata tamaa	Hakuna kabisa 1 Siku kadhaa 2 Zaidi ya nusu ya siku 3 Karibia kila siku 4	
Q1105	Katika wiki mbili zilizopita, ni mara ngapi umekuwa ukisumbuliwa na shida zifuatazo: Kutokuwa na uwezo wa kuacha au kudhibiti wasiwasi?	Hakuna kabisa 1 Siku kadhaa 2 Zaidi ya nusu ya siku 3 Karibia kila siku 4	
		Hakuna jibu 98	

Sehemu ya 12: Afya mtandaoni (Afya kwa njia ya simu)

Taarifa ya utangulizi (MSOMEE MHOJIWA KWA SAUTI): *Sasa ningependa kukuuliza maswali kadhaa kuhusu afya kwa njia ya mtandao.*

Na.	Maswali	Majibu	Nenda swali nambari
Q1201	Wewe una uzoefu kiasi gani na matumizi ya simu janja (smartphones)?	Nina uzoefu sana 1 Nina uzoefu wa kawaida 2 Sina uzoefu 3 Sina uzoefu kabisa 4 Hakuna jibu 98	
Q1202	Ni kama mara ngapi unawasha data kwenye simu janja (smartphone) yako?	Mara nyingi kwa siku 1 Masaa machache tu kila siku 2 Sio kila siku, lakini mara mbili hadi sita kwa wiki 3 Karibu mara moja kwa wiki 4 Chini ya wiki moja 5 Hakuna jibu 98	
Q1203	Katika kipindi cha wiki moja iliyopita, ni kiasi gani cha fedha umetumia kwa ajili ya mtandao/vifurushi? *TZS. Ikiwa hajui andika 997*	_____(TZS)	
Q1204		Ndio 1	

Na.	Maswali	Majibu	Nenda swali nambari
	Katika kipindi cha mwezi mmoja uliopita, kumekuwa na kipindi ambacho hukuwa na mtandao? (Kwa sababu yoyote ile)	Hapana 2	⇨ Q1205
Q1204a	Ni kwa muda wa siku ngapi hukuwa na mtandao kwenye simu janja (smartphone) yako katika kipindi cha miezi mitatu iliyopita? *Ikiwa hajui andika 997*	Siku_____	
Q1204b	Ni kwa sababu gani hukuweza kuwa na mtandao kwa vipindi hivyo?	Sikuweza kumudu gharama ya vifurushi 1 Simu ilipotea au kuibiwa 2 Simu ilikuwa haifanyi kazi 3 Nyingine, zitaje_____88 Sikumbuki 97 Hakuna jibu 98	
Q1205	Ni mitandao ipi ya kijamii ambayo umeshawahi kutumia kwenye simu yako ya mkononi? (ZUNGUSHIA YOTE ANYAOTUMIA)	WhatsApp 1 Facebook. 2 Telegram. 3 Twitter. 4 Jamii forum 5 Instagram 6 Mingine (Itaje)----------88 Hakuna jibu 98	
Q1206	Ni mitandao ipi ya kijammi inayohusu mahusiano kimapenzi ambayo umewahi kutumia kwenye simu yako ya mkononi? (ZUNGUSHIA YOTE ALIYOTAJA)	Grindr. 1 Hornet 2 Tinder 3 Sijawahi kutumia app ya mapenzi 4 Mingine (itaje)……. 88 Sikumbuki. 97 Hakuna jibu. 98	
Q1207	Umeshawahi kutumia program za simu ya mkononi zinazohusiana na afya hapo awali?	Ndio 1 Hapana 2	⇨ Q1209
Q1208	Programu ipi ulitumia?	_____(taja)	
Q1209	Katika mwezi uliopita, umetumia simu yako kwa ajili ya kutafuta taarifa kuhusu afya?	Ndiyo 1 Hapana 2 Hakuna jibu 98	
Q1210	Unafikiri matumizi ya simu kwa ajili ya kutoa taarifa za afya ni njia nzuri ya kuwafikishia watu taarifa za kiafya?	Ndio 1 Hapana 2 Sijui 98	

Sehemu ya 13: Programu ya Jichunge

Taarifa ya utangulizi (MSOMEE MHOJIWA KWA SAUTI): *Sasa nitakuuliza maswali kuhusu programu ya Jichunge ambayo umewekewa kwenye simu yako.*

Na.	Maswali	Majibu	Nenda swali nambari
Q1301	Kwa mtazamo wako umekionaje kipindi cha utambulisho wa *Jichunge* kwa siku ya leo?	Kibaya sana 1 Kibaya 2 Kizuri 3 Kizuri sana 4	
Q1302	Ni kwa kiwango gani umeelewa ulichoelezewa?	Kidogo sana 1 Kidogo 2 Kiasi 3 Sana 4	
Q1303	Uliona ugumu au urahisi gani wa kutumia programu ya Jichunge?	Ngumu sana 1 Ngumu 2 Rahisi 3 Rahisi sana 4	
Q1304	Ni kipengele kipi cha Jichunge ulikipenda zaidi?	Kukumbushwa dawa 1 Mawasiliano na mwelimishaji rika 2 Kuwasiliana na daktari 3 Makala za elimu ya afya 4 Kuchati na watumiaji wengine wa Jichunge 5 Kujaribu kushinda zawadi 6 Mchezo wa kufuatilia maendeleo yangu 7 Hakuna jibu 98	
Q1305	Ni kipengele gani cha *Jichunge* unadhani utatumia zaidi?	Kukumbushia dawa 1 Kuwasiliana na muelimishaji rika 2 Kuwasiliana na daktari 3 Makala za elimu ya afya 4 Kuchati na watumiaji wengine wa Jichunge 5 Kujaribu kushinda zawadi 6 Mchezo wa kufuatilia maendeleo yangu 7 Hakuna jibu 98	

Mitazamo / faida tarajiwa / vikwazo vya kutumia programu ya Jichunge (inaulizwa tu kwa kikundi chenye kutumia Jichunge).

Hisia/faida zinazotegemewa/vizuiziTaarifa ya utangulizi (MSOMEE MHOJIWA KWA SAUTI): Sasa ningependa kukuuliza juu ya matarajio yako ya programu ya Jichunge. Tafadhali nipe mawazo yako kwa kila nitakachokuuliza kwa kutumia moja ya majibu yafuatayo: Sikubaliani Kabisa, Sikubaliani, Sikubali wala sikatai, Nakubaliana kidogo, Nakubaliana sana.

Na.	Maswali	Majibu	Nenda swali nambari
Q1306	Programu ya Jichunge itaongeza sana gharama ya kununua vifurushi vya mtandao	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana kidogo 4 Nakubaliana sana 5	
Q1307	Programu ya Jichunge itatumia muda mwingi	Sikubaliani kabisa 1 Sikubaliani 2	

Na.	Maswali	Majibu	Nenda swali nambari
		Sikubali wala sikatai 3 Nakubaliana kidogo 4 Nakubaliana sana 5	
Q1308	Programu ya Jichunge inaweza kufichua tabia zako za mapenzi	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana kidogo 4 Nakubaliana sana 5	
Q1309	Programu ya Jichunge itawafanya marafiki zako wajue kuwa wewe ni mfanyabiashara ya ngono	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana kidogo 4 Nakubaliana sana 5	
Q1310	Programu ya Jichunge itakuwa muhimu katika kuboresha afya yako	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana kidogo 4 Nakubaliana sana 5	
Q1311	Programu ya Jichunge itakusaidia kuelewa zaidi kinga ya VVU	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana kidogo 4 Nakubaliana sana 5	
Q1312	Programu ya Jichunge itakusaidia kubakia bila maambukizi	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana kidogo 4 Nakubaliana sana 5	
Q1313	Programu ya Jichunge itaboresha upatikanaji wa PrEP kwako	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana kidogo 4 Nakubaliana sana 5	
Q1314	Programu ya Jichunge itakusaidia kukabiliana na madhara yatokanayo na PrEP	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana kidogo 4 Nakubaliana sana 5	
Q1315	Programu ya Jichunge itakusaidia kuwasiliana na waelimishaji rika	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana kidogo 4 Nakubaliana sana 5	
Q1316	Programu ya Jichunge itakurahisishia wewe kuwasiliana na mtoa huduma wako wa PrEP	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana kidogo 4 Nakubaliana sana 5	
Q1317	Programu ya Jichunge itakusaidia kupata taarifa za afya ya mahusiano ya kimapenzi na ushauri	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3	

Na.	Maswali	Majibu	Nenda swali nambari
		Nakubaliana kidogo 4 Nakubaliana sana 5	
Q1318	Programu ya Jichunge itakukumbusha kutumia PrEP mara kwa mara	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana kidogo 4 Nakubaliana sana 5	
Q1319	Programu ya Jichunge itaboresha uelewa wako juu ya PrEP	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana kidogo 4 Nakubaliana sana 5	
Q1320	Taarifa zako zitakuwa salama wakati wa kutumia programu ya Jichunge	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana kidogo 4 Nakubaliana sana 5	
Q1321	Mpenzi wako wa mara kwa atapendelea utumie programu ya Jichunge	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana kidogo 4 Nakubaliana sana 5	
Q1322	Wateja wako watapenda utumie programu ya Jichunge	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana kidogo 4 Nakubaliana sana 5	
Q1323	Wanafamilia wako watapenda utumie programu ya Jichunge	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana kidogo 4 Nakubaliana sana 5	
Q1324	Itakuwa rahisi kwako kutumia programu ya Jichunge	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana kidogo 4 Nakubaliana sana 5	
Q1325	Simu yako ina nafasi ya kutosha kwa ajili ya programu ya Jichunge	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana kidogo 4 Nakubaliana sana 5	
Q1326	Utajivunia kuwa na programu ya Jichunge kwenye simu yako	Sikubaliani kabisa 1 Sikubaliani 2 Sikubali wala sikatai 3 Nakubaliana kidogo 4 Nakubaliana sana 5	

Muda wa kumaliza: |__|__|

ASANTE SANA

Supplementary file: Directed Acyclic Graphs for paper I

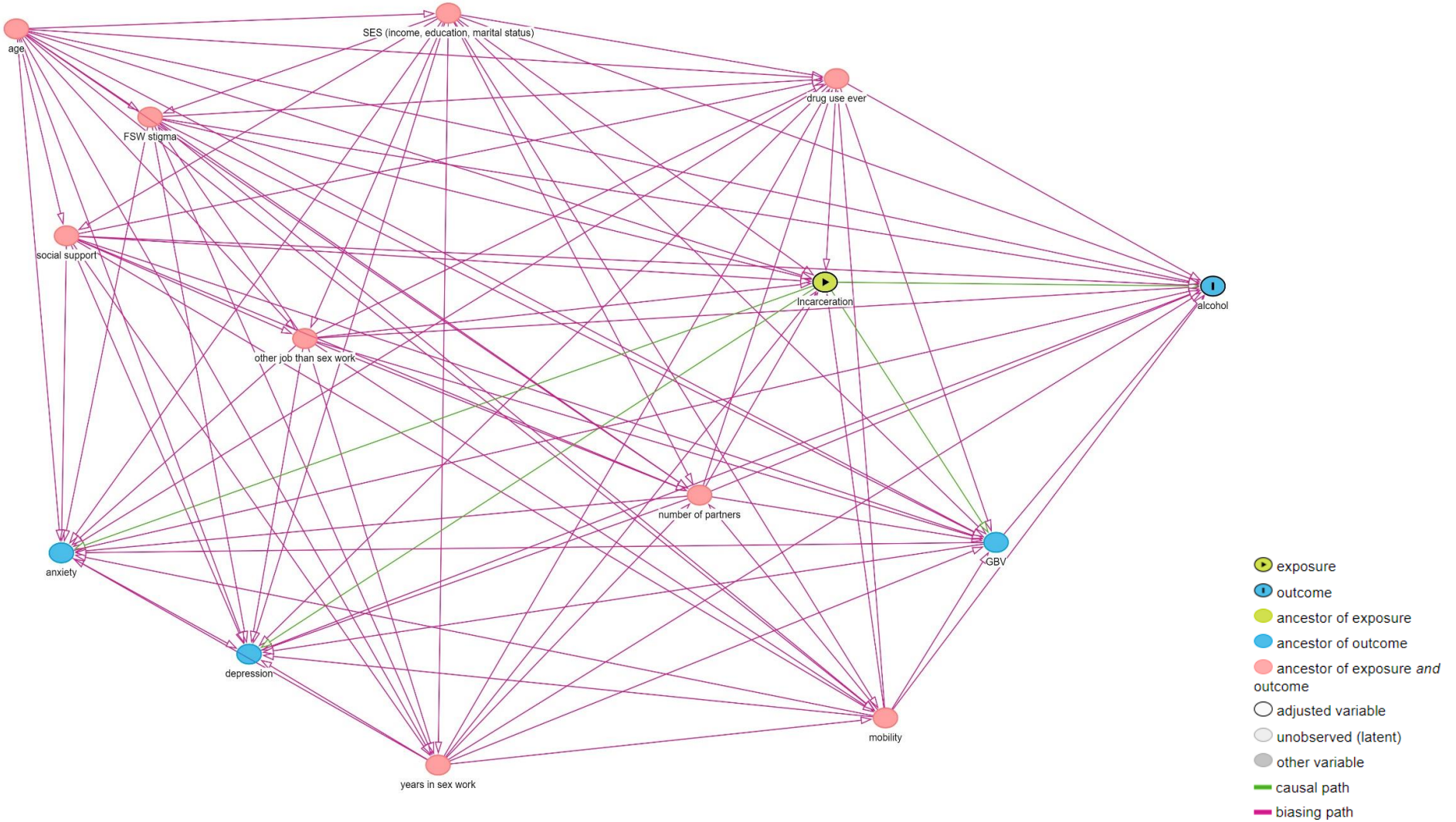

Figure 1F: Directed Acyclic Graph conceptualizing the relationship between incarceration/arrest and harmful alcohol use. Minimal sufficient adjustment set: age, FSW stigma, socio-economic status (SES) (here: income, marital status, education), social support, drug use ever other job than sex work, years in sex work, number of clients/month, mobility. The graph was drawn using dagitty.net

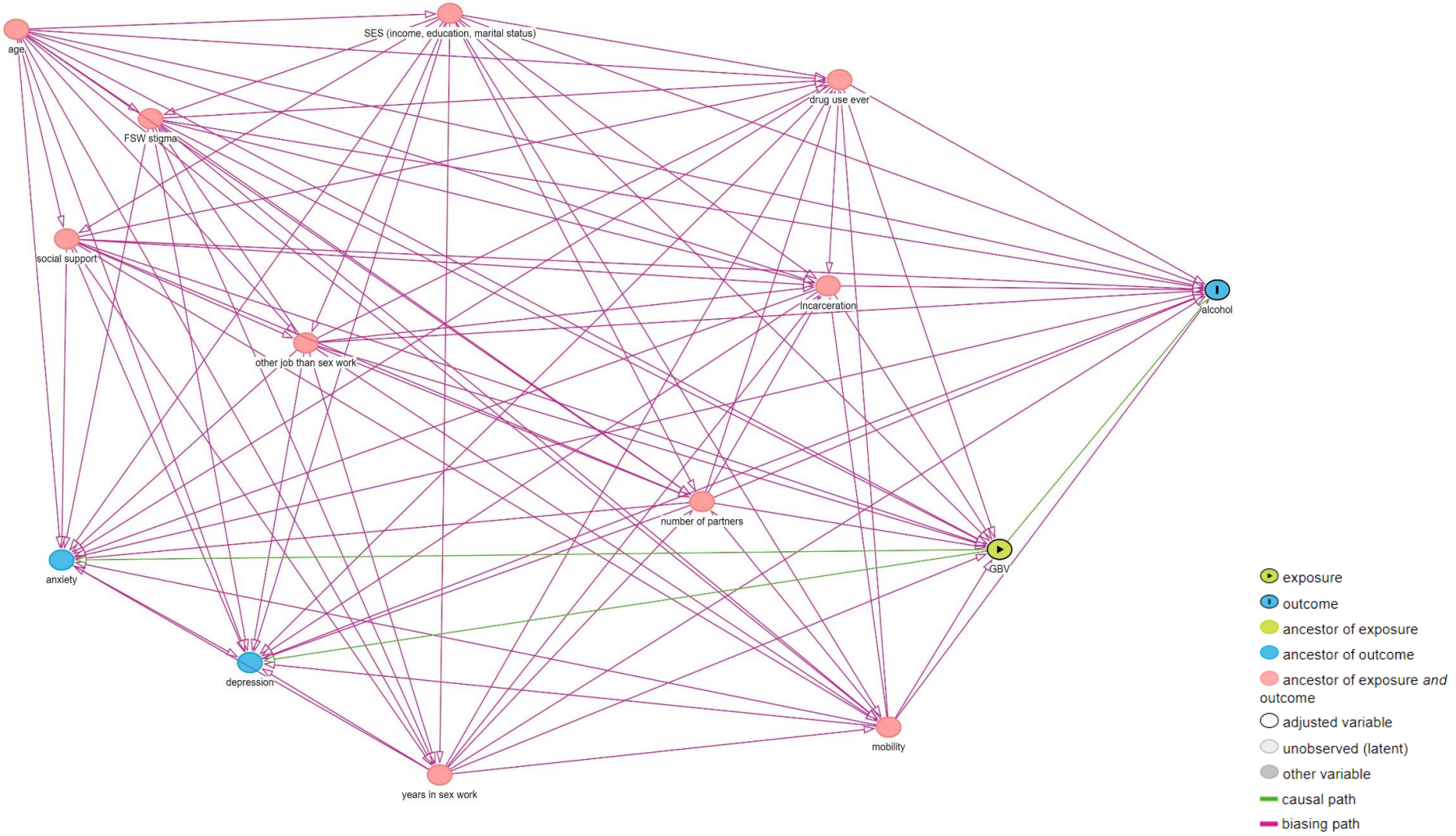

Figure 2F: Directed Acyclic Graph conceptualizing the relationship between GBV and harmful alcohol use. Minimal sufficient adjustment set: age, FSW stigma, socio-economic status (SES) (here: income, marital status, education), incarceration, social support, drug use ever, other job than sex work, years in sex work, number of clients/month, mobility. The graph was drawn using dagitty.net

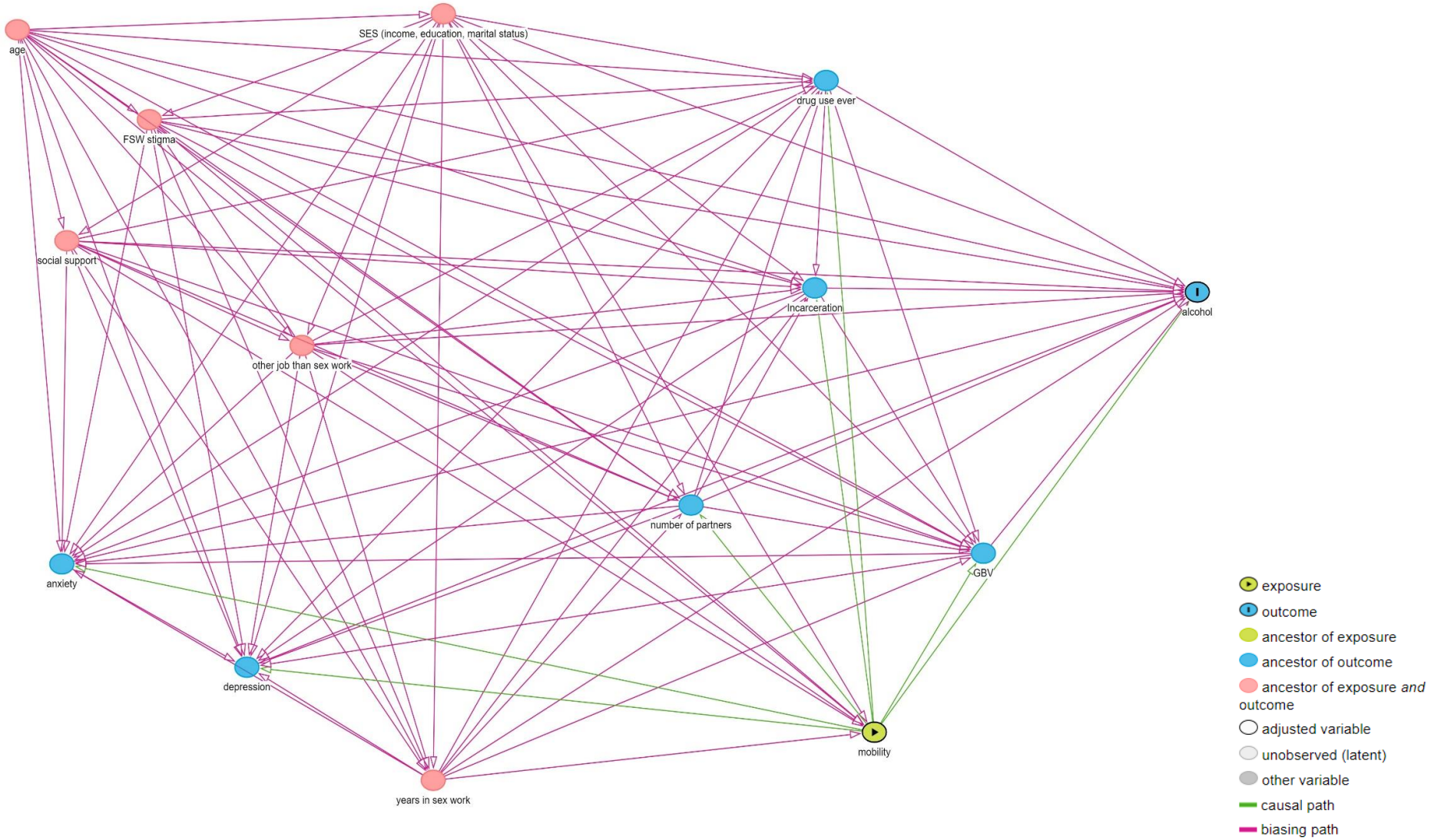

Figure 3F: Directed Acyclic Graph conceptualizing the relationship between mobility and harmful alcohol use. Minimal sufficient adjustment set: age, FSW stigma, socio-economic status (SES) (here: income, marital status, education), social support, other job than sex work, years in sex work. The graph was drawn using dagitty.net

Supplementary file: Directed Acyclic Graphs

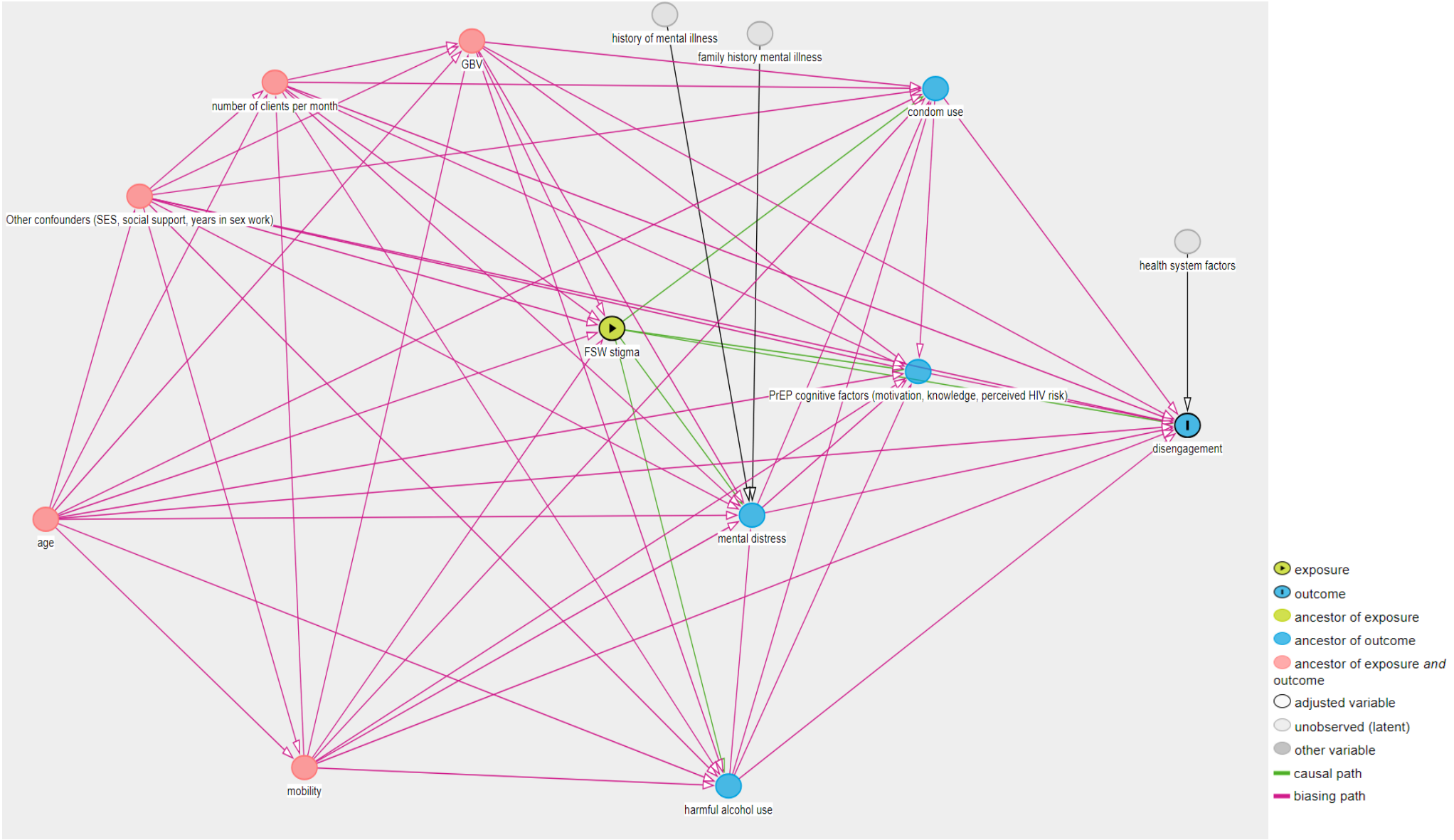

Figure 1S: Directed Acyclic Graph conceptualizing the relationship between female sex worker stigma (FSW stigma) and disengagement from PrEP services. Minimal sufficient adjustment set: Socio-economic status (SES) (here: income, marital status, education), social support, years in sex work, number of clients/month, gender-based violence (GBV), mobility and age. The graph was drawn using dagitty.net (41).

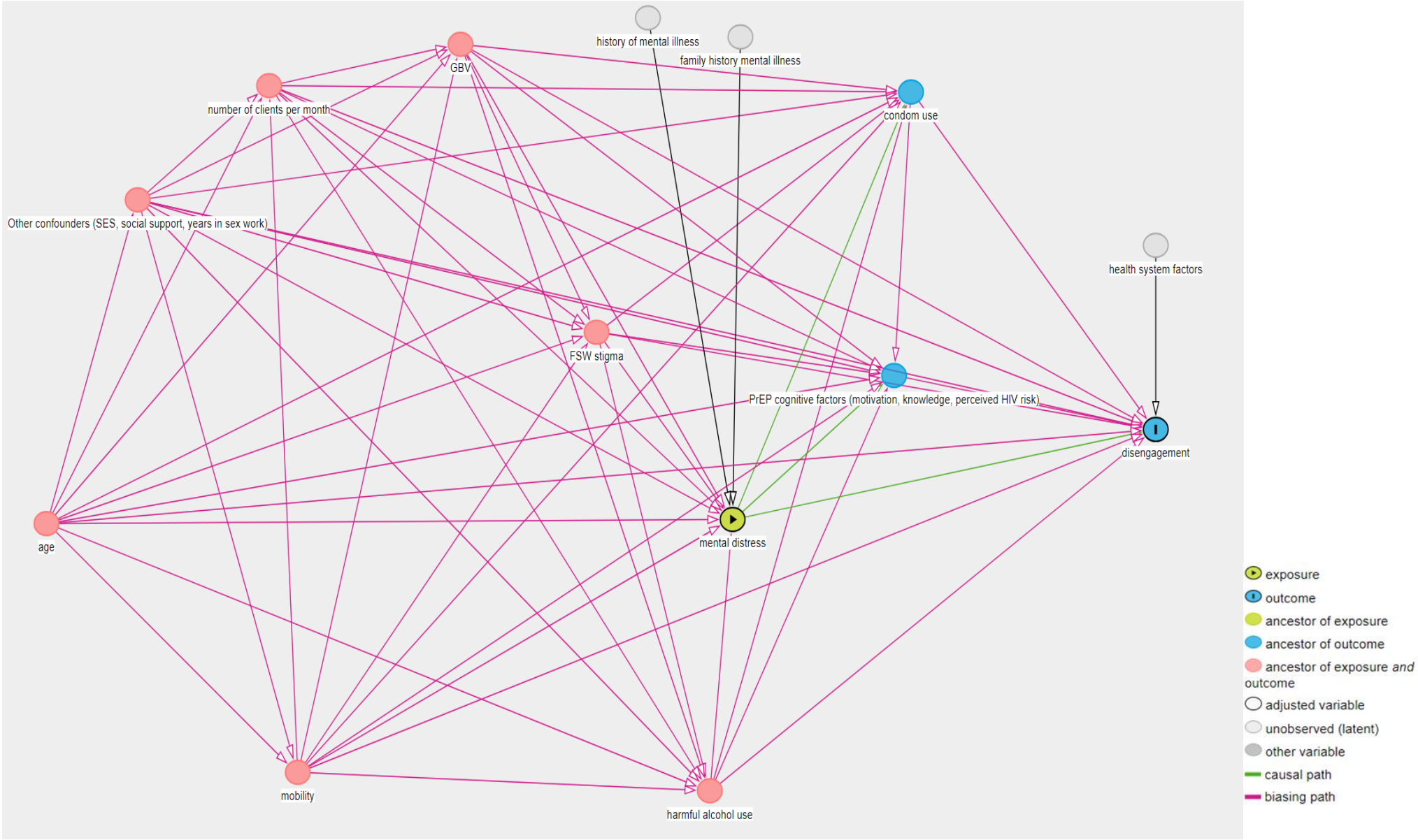

Figure 2S: Directed Acyclic Graph conceptualizing the relationship between mental distress and disengagement from PrEP services. Minimal sufficient adjustment set: Socio-economic status (SES) (here: income, marital status, education), social support, years in sex work, number of clients/month, gender-based violence (GBV), mobility, age, harmful alcohol use and FSW stigma. The graph was drawn using dagitty.net (41).

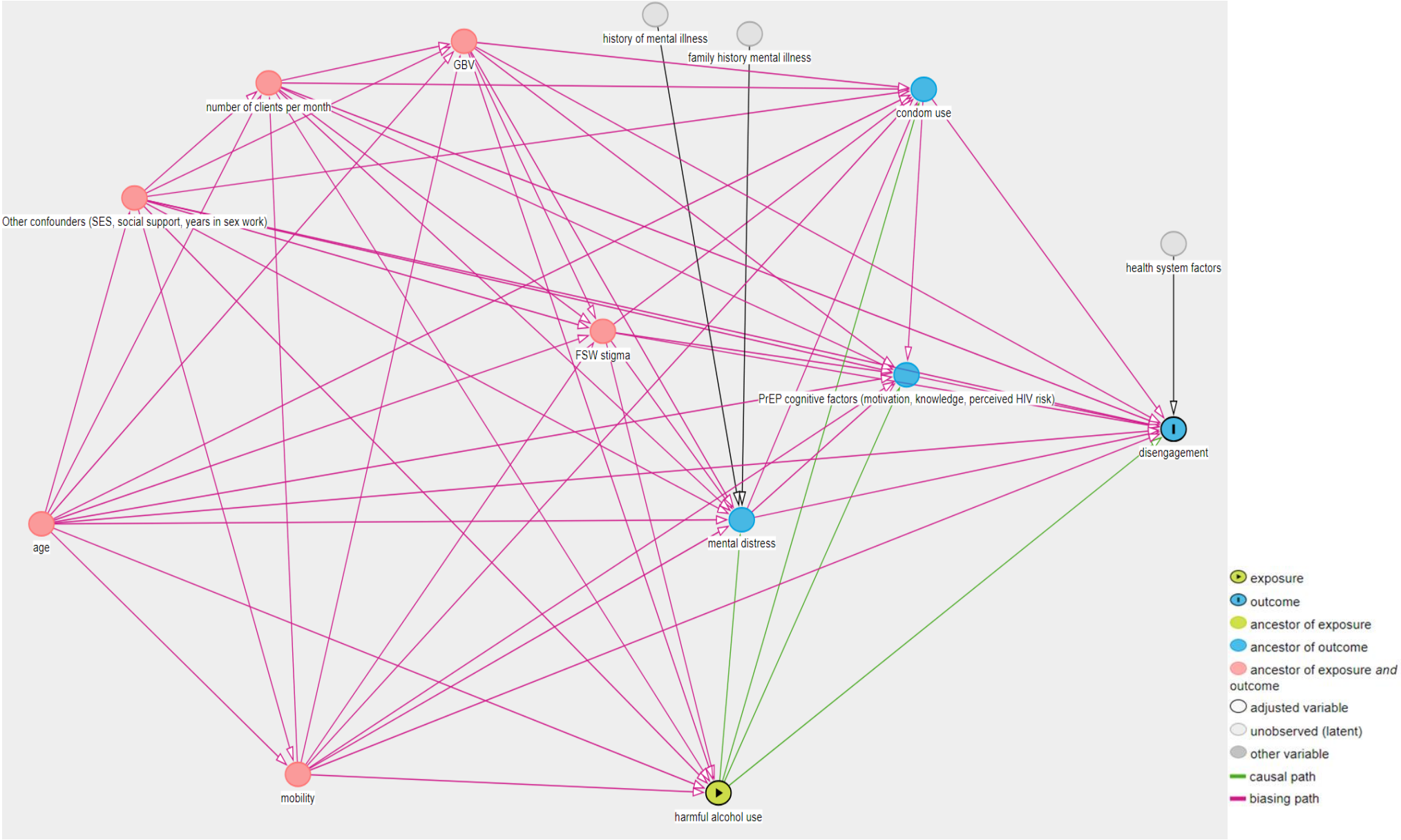

Figure 3S: Directed Acyclic Graph conceptualizing the relationship between harmful alcohol use and disengagement from PrEP services. Minimal sufficient adjustment set: Socio-economic status (SES) (here: income, marital status, education), social support, years in sex work, number of clients/month, gender-based violence (GBV), mobility, age and FSW stigma. The graph was drawn using dagitty.net (41).

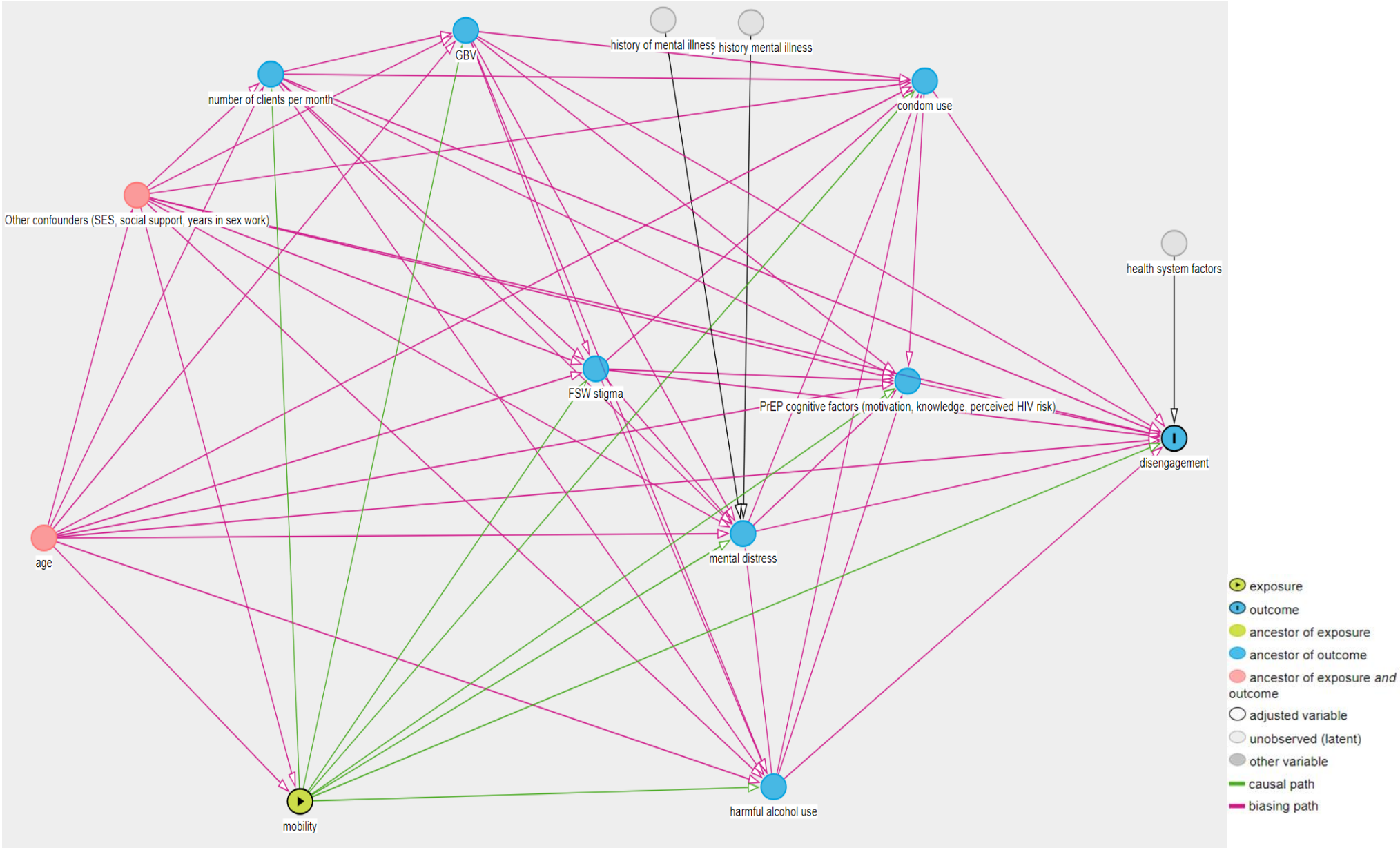

Figure 4S: Directed Acyclic Graph conceptualizing the relationship between mobility and disengagement from PrEP services. Minimal sufficient adjustment set: Socio-economic status (SES) (here: income, marital status, education), social support, years in sex work and age. The graph was drawn using dagitty.net (41).

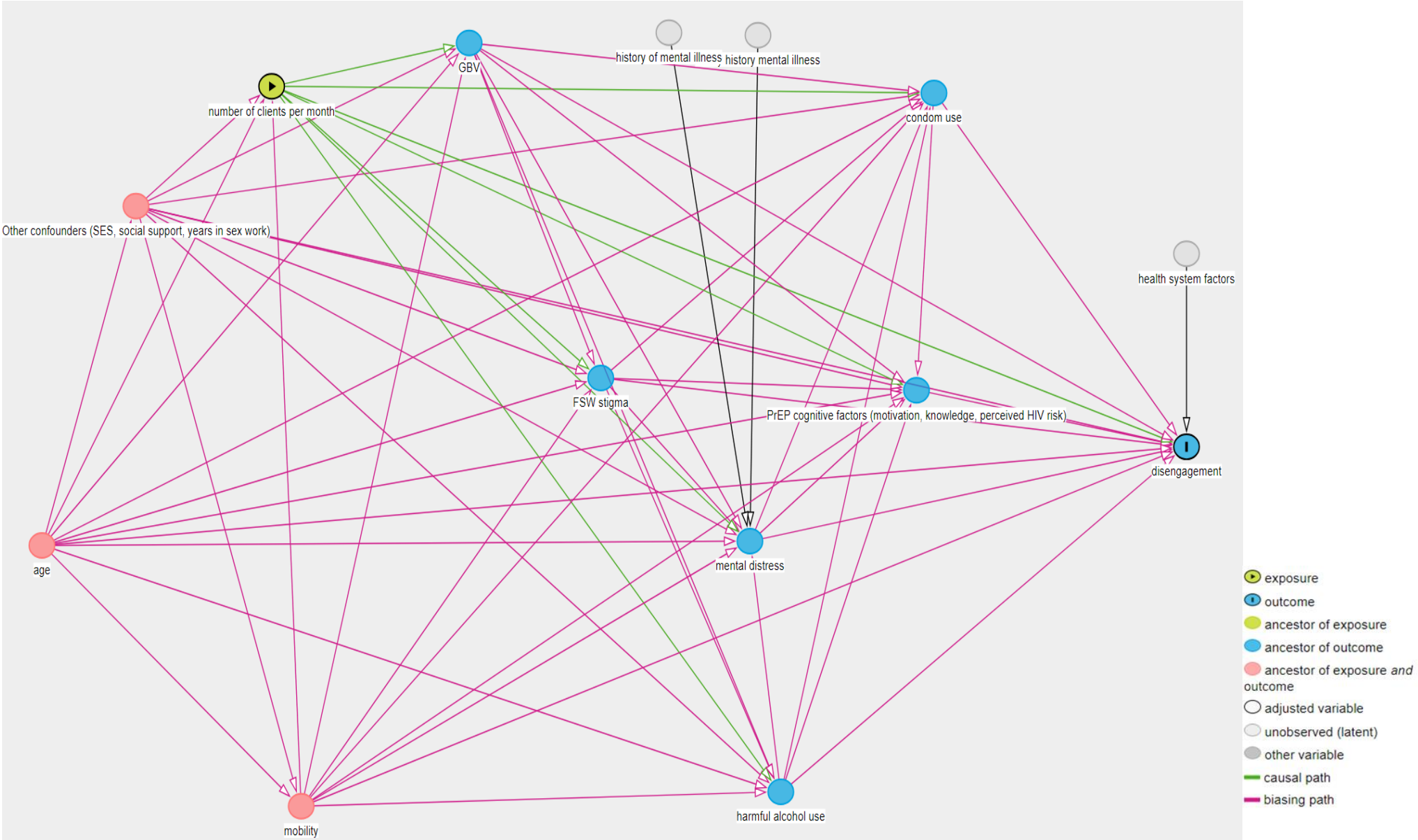

Figure 5S: Directed Acyclic Graph conceptualizing the relationship between number of clients per month and disengagement from PrEP services. Minimal sufficient adjustment set: Socio-economic status (SES) (here: income, marital status, education), social support, years in sex work, mobility and age. The graph was drawn using dagitty.net (41).

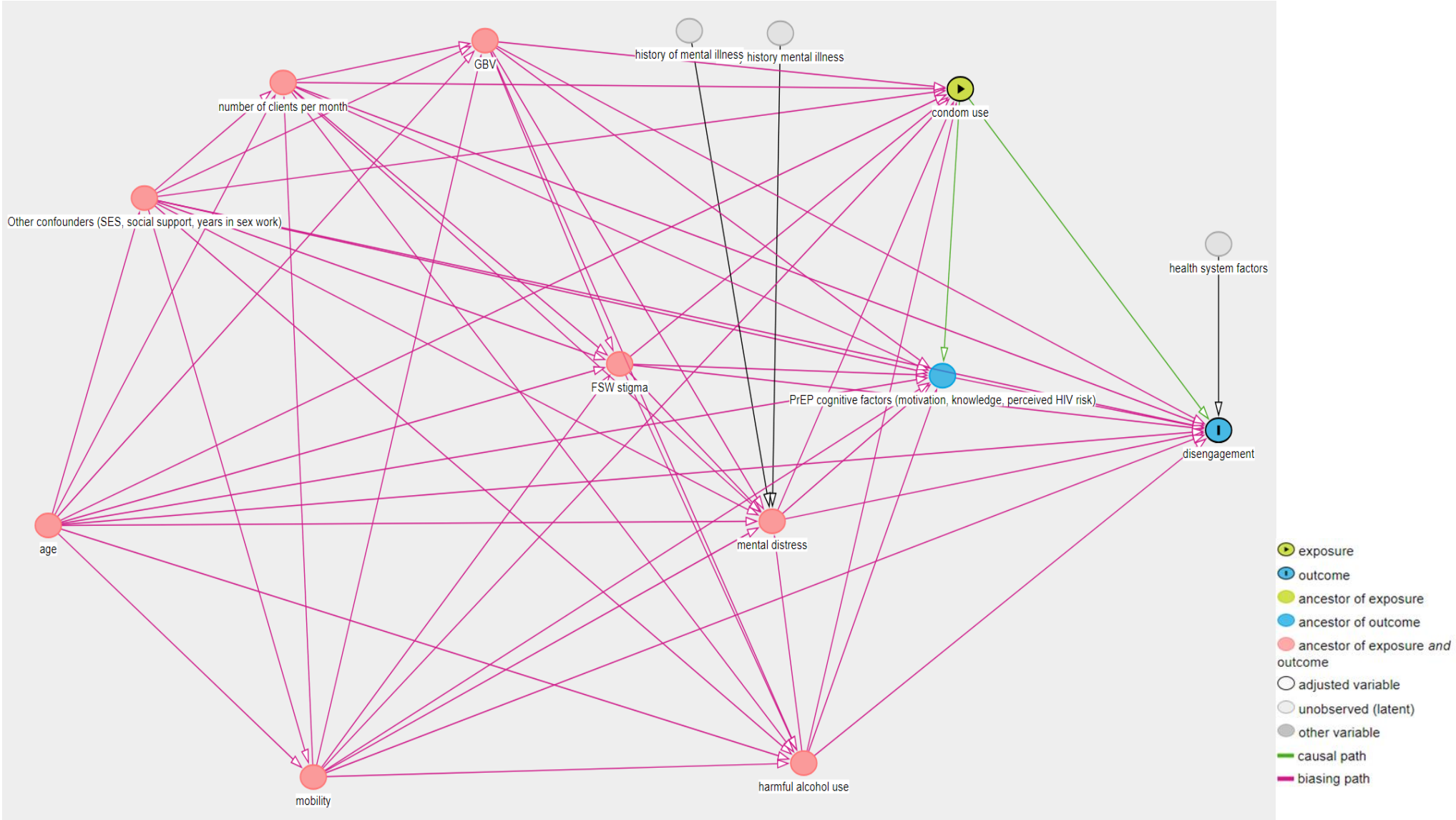

Figure 6S: Directed Acyclic Graph conceptualizing the relationship between condom use and disengagement from PrEP services. Minimal sufficient adjustment set: Socio-economic status (SES) (here: income, marital status, education), social support, years in sex work, number of clients/month, gender-based violence (GBV), mobility, mental distress, harmful alcohol use, female sex worker stigma and age. The graph was drawn using dagitty.net (41).

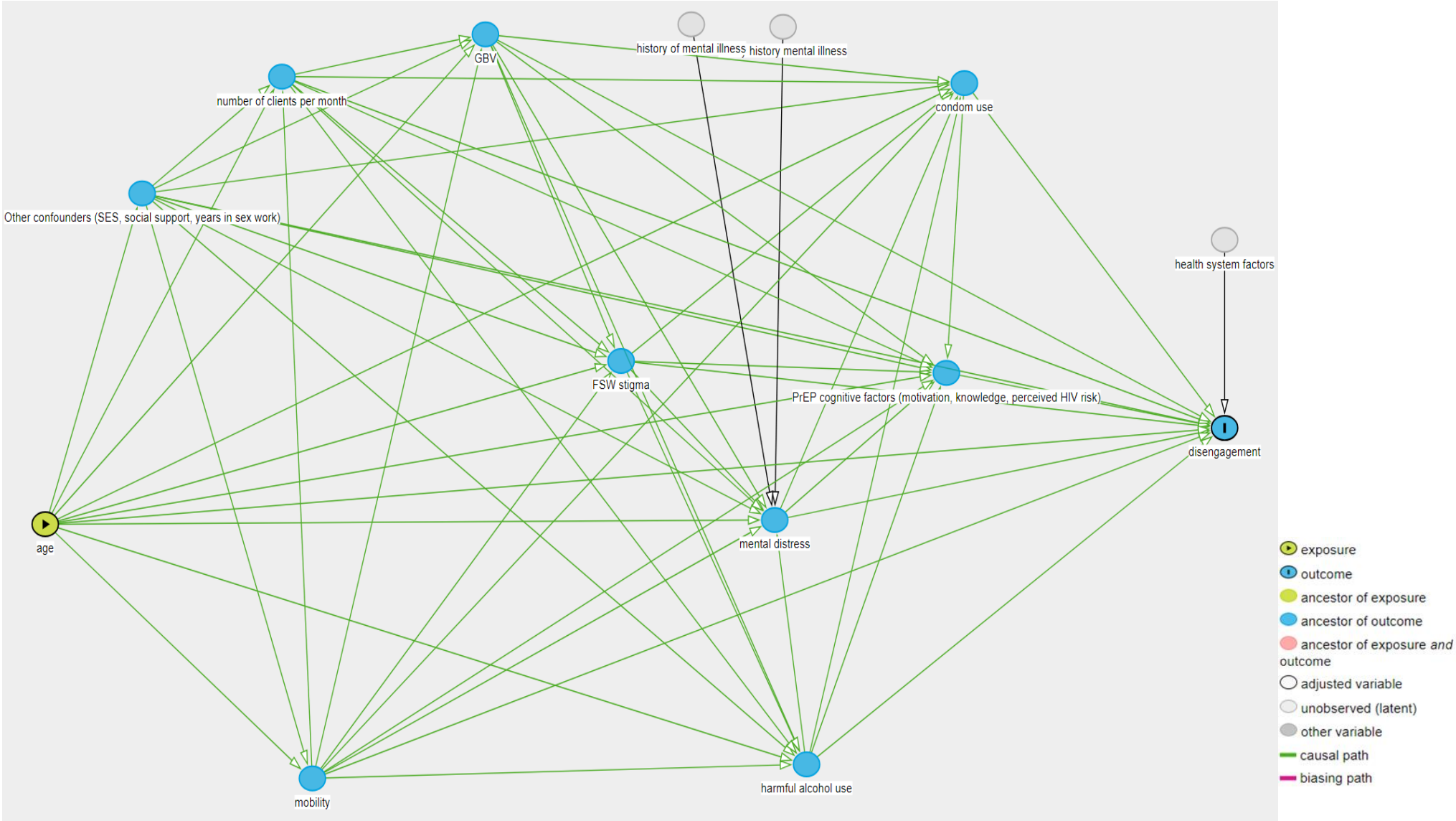

Figure 7S: Directed Acyclic Graph conceptualizing the relationship between age and disengagement from PrEP services. No adjustment necessary to estimate the total effect of age. The graph was drawn using dagitty.net (41).

Qualitative research tool Interview guide

1. Baseline– female sex workers

Background

- Age
- Education
- Family
- Partner(s) (non-paying)
- Living conditions
- Work (sex work and other work)
- Use and non-use of HIV prevention

Understandings of PrEP

- Sources of information about PrEP
- Feelings about PrEP
- How safe is PrEP perceived to be
- Perceived protection against PrEP
- Importance of PrEP
- Advantages
- Disadvantages
- Fears

Expectations of PrEP (including experiences if used before)

- Prior use of PrEP
- Whether PrEP will/have change(d) anything
- Stories about PrEP use
- How is it (will be) to take/use
- How it (will) makes one feel
    - Safer
    - Protected
    - As a "patient"
    - At risk
    - Other things
- How it (will) influence daily life
- How it (will) influence sex
- How it (will) influence love
- Perceived side effects
- (Perceived) Role of condoms when using PrEP
- (Perceived) role of lubricants when using PrEP
- (Perceived) role of HIV testing when using PrEP
- Other uses of PrEP
- Storing PrEP
- (Anticipated) reactions from others
- Who have you told

PrEP and sex work

- Using PrEP in sex work
    - (Perceived) advantages
    - (Perceived) disadvantages
    - Stories
- Anticipating clients' reactions to PrEP
- PrEP and other means of HIV prevention

Adherence to PrEP

- How have you been told to take PrEP
- How are you planning to take PrEP
- (Perceived) challenges taking PrEP as prescribed
- Thoughts on anything that will make it easier to take

Discontinuation of PrEP

- What might make you stop taking PrEP
- How long you think you will take PrEP

Experiences with PREPTA and PrEP-roll out

- Learning about the study
- Initial thoughts about the study
- Decision to attend the study
- Thoughts on the organization
    - Enough information
    - Clinic
    - Dispensing of pills
    - Lab
    - Interview
    - Plan for follow-up visit
- What has gone well
- What can be improved
- Stories/talk about the study/PREPTA among FSW
- Perefrence for how PrEP is delivered/PrEP services is organized
- Feeling if PrEP was not available

2. Follow-up interviews– female sex workers

Background

- Age
- Education
- Family
- Partner(s) (non-paying)
- Living conditions
- Entry into sex work
- Likes and dislikes about your work
- Reactions from others about work
- Use and non-use of HIV prevention
- Preferences for HIV prevention

Understandings of PrEP

- Sources of information about PrEP
- Feelings about PrEP
- How safe is PrEP perceived to be
- Advantages
- Disadvantages
- Fears
- Need for PrEP
- Misconceptions about PrEP
- Importance of other FSWs view of PrEP

Experiences

- How did you come to start using PrEP
- Role of peers and other sex workers in the starting and continued use of PrEP
- Whether PrEP has changed anything
- Stories about PrEP use
- How is it to take/use
- How PrEP makes one feel
- How has it influenced daily life
- How has it influenced sex (if so)
- How has it influenced love (if so)
- Side effects
- Role of condoms when using PrEP
- PrEP compared to other HIV prevention
- Role of HIV testing when using PrEP
- Other uses of PrEP
- Storing PrEP
- Disclosing PrEP use to others
- Reactions from others
- Alcohol use and PrEP

PrEP and sex work

- Advantages
- Disadvantages
- Stories
- Clients' reactions to PrEP

Adherence to PrEP

- How have you been told to take PrEP
- How have you taken PrEP
- Any challenges taking PrEP
- Anything that will make it easier to take
- Thoughts about what happens if forget to take it

Discontinuation of PrEP

- What might make you stop/discontinue PrEP
- How long you think you will take PrEP
- *If have stopped:*
    - why did you stop
    - when did you begin thinking about stopping
    - perceived current HIV risk
    - discussed with friends, partner, health provider
    - thoughts about re-starting
    - role of other HIV prevention
- Stories from other sex workers who have discontinued PrEP

Follow-up/refill

- If did not attend their follow-up:
    - What was the reason(s)
    - Deliberate decision or unintentional; if unintential; what happened that day/time.
    - Ideas about how to organize refill of PrEP/follow-up better

Experiences with PREPTA

- Learning about the study
- Initial thoughts about the study
- Decision to attend the study
- Thoughts on the organization
    - Information
    - Clinic at baseline

    - Dispensing of pills
    - Lab
    - Interview
    - Follow-up visits
    - Calls
- What has gone well
- What can be improved
- Stories/talk about the study/PREPTA among FSW
- Jichunge