



Government of Malawi

# MALAWI BIOLOGICAL AND BEHAVIOURAL SURVEILLANCE SURVEY

2019-2020



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act:onaid

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## **Preface**

We are pleased to present the report of the Malawi Biological and Behavioural Surveillance Survey (BBSS), 2019-2020. Malawi BBSS 2019-2020 was implemented to track trends in the HIV and AIDS indicators for the three key populations. The study was also expected to come up with the population size estimates of Female Sex Workers and Men having Sex with other Men. The design was a combination of desk review and quantitative data collection methods. To improve further on precision and the outcomes the team used Responded Driven Sampling (RDS) to capture these “hard to reach” key populations. Just like the 2013-14 BBSS, the BBSS 2019-2020 also included a biological test component (HIV and syphilis testing) to determine the level of HIV and syphilis prevalence among the selected high-risk key population groups.

This report is a product of a collaborative effort, led by the National AIDS Commission (NAC) implemented by the National Statistics Office (NSO), with technical input and support from all national and international organizations/institutions representing the BBSS Technical Task Team in Malawi. We would therefore like to recognise the efforts of a number of organizations and individuals who contributed immeasurably to the accomplishment of the survey. First, we would like to acknowledge financial assistance from the Global Fund through Action Aid Malawi. Without such resources these initiatives are mostly impossible to accomplish. We would also like to acknowledge National AIDS Commission, Centers for Disease Control and Prevention (CDC), University of North Carolina (UNC) Project-Malawi, National HIV Reference Laboratory (NHRL), Department of HIV and AIDS (DHA), Centre for the Development of People (CEDEP) and Directors of Health and Social Services (DHSS) in all participating districts for the technical assistance rendered to the staff of the NSO, MOH and NAC during the survey implementation period. This team made it possible that the survey is implemented with the most plausible protocol, acceptable data collection tools, well trained Research Assistants and efficient data analysis models. We would like to acknowledge the following groups for their assistance in accessing the respondents of the study: volunteers trained by the Ministry of Health, UNC Project-Malawi, CEDEP and NSO. We are subsequently, greatly indebted to the various respondent groups who generously gave their time to provide the information that forms the basis of this report. Despite the negative effects of the COVID-19 pandemic and other blood sucking myths during the data collection period, NSO would also like to thank the Global Fund for offering technical support in ensuring that the process is completed with good quality and high level of acceptability.

We hope this publication will reach a wider audience and serve to inform policy and program decision making at the national, regional, and community levels in responding to HIV and AIDS particularly among groups at high risk in Malawi. We also hope that the information contained in this publication will be used to intensify efforts to prevent the spread of HIV and provide support to those affected by the epidemic.

**Mercy Kanyuka (Mrs.)**  
**Commissioner of Statistics**

## Acronyms and Abbreviations

AIDS	Acquired Immune Deficiency Syndrome
ANC	Antenatal clinic
BBSS	Biological and behavioural surveillance survey
BSS	Behavioural surveillance survey
CAPI	Computer Assisted Personal Interview
CDC	Centers for Disease Control and Prevention
CEDEP	Centre for the Development of People
CHAM	Christian Health Association of Malawi
CoFSW	Client of Female Sex Worker
DBS	Dried Blood Spot
DHA	Department of HIV and AIDS
DHS	Demographic and Health Surveys
DHSS	Director of Health and Social Services
EQA	External Quality Assurance
DTS	Dried Tube Specimen
FHI	Family Health International
FPAM	Family Planning Association of Malawi
FSWA	Female Sex Workers Association
FSW	Female Sex Worker
GDP	Gross Domestic Product
HIV	Human Immunodeficiency Virus
HTS	HIV Testing Services
MDHS	Malawi Demographic and Health Survey
MSM	Men who have Sex with Men
NAC	National AIDS Commission
NHLS	National Health Laboratory Services
NHRL	National HIV Reference Laboratory
NSO	National Statistical Office
PLHIV	People living with HIV
PPS	Probability proportional to size
RT-PCR	Reverse Transcriptase Polymerase Chain Reaction
SPSS	Statistical Package for Social Sciences
STI	Sexually transmitted infections
TA	Traditional Authority
TWG	Technical Working Group
UNC	University of North Carolina
UNDP	United Nations Development Program

## **Executive Summary**

### **Background**

The Biological and Behavioural Surveillance Survey (BBSS) is a monitoring and evaluation tool designed to track trends in HIV/AIDS-related knowledge, attitudes and behaviours in subpopulations at particular risk of HIV infection, such as Female Sex Workers (FSWs), clients of Female Sex Workers (CoFSW) and Men who have Sex with Men (MSM). The BBSS consists of repeated cross-sectional surveys conducted systematically to monitor changes in HIV/sexually transmitted infections (STI) risk behaviours based on HIV and STI surveillance methods.

BBS surveys have been conducted in more than 25 countries and their use is growing. Since 1999, they have been used in Asia and Africa, where they have proved beneficial in understanding the pandemic from regional and country-specific perspectives. In several countries, multiple rounds of BBSS have already been conducted, with the trend data used to formulate new programmes and to adapt existing ones. In Malawi this is the fourth round of BBSS and has been conducted after a series of meetings at technical working group (TWG) level that comprised all the relevant stakeholders.

### **Objectives**

The main objective of this study was to obtain biological and behavioural information on population groups considered at higher risk of HIV infection with a view to support HIV prevention, treatment, care and support programs among them. Over time, with repeated surveys, to provide information on behavioural patterns amongst key target; to assess prevalence of HIV and syphilis for high risk population groups; to open and develop a dialogue on HIV/AIDS amongst the population from the policy to the community level; to obtain data in a relatively standardized format that may enable comparison with other BBSSs carried out in other countries; and to estimate the population size of Female Sex Workers and Men who have Sex with Men in order to guide program planning and their interventions.

### **Methodology**

The BBSS was conducted among three sub-populations at risk of HIV in eight selected districts of Malawi, namely Female Sex Workers, clients of Female Sex Workers and Men who have Sex with Men. Two groups, FSW and CoFSW were interviewed in the previous BBSS of 2013. MSM were interviewed for the first time in this study. Sample size was calculated for each target population group and each group was sampled separately. Unlike the other previous surveys, qualitative data was not collected from the participants in this study.

To estimate the number of Female Sex Workers and Men who have Sex with Men in the country, a population size estimation (PSE) component using two stage Capture – Recapture method was included in the BBSS. First step in this survey was to identify peer educators for both

populations in the district and train them on how to distribute unique identifiers to members of each key population. Follow up questions during data collection were used as a second capture. Then district estimates were calculated and used to derive national estimates for Female Sex Workers and Men who have Sex with Men.

## Key Findings

The 2019-2020 BBSS targeted three types of key populations, namely Female Sex Work (FSW), Men who have Sex with Men (MSM) and Clients of Female Sex Worker (CoFSW). All the participants in the study were sexually active in the last 12 months prior to the study with majority of them being active in the past 3 months.

HIV prevalence was highest among Female Sex Workers at 49.9% followed by Men who have Sex with Men 12.8% and lastly clients of Female Sex Workers 12.1%.

**Table 1. HIV and syphilis prevalence (unweighted)**

Key Population	HIV Prevalence	Syphilis Prevalence	N
	Proportion	Proportion	
Female Sex Worker	49.9	32.6	3,103
Men who have Sex with Men	12.8	9.0	1,965
Clients of Female Sex Worker	12.1	7.2	2,223

The trend in HIV prevalence by age is the same in all the three key populations whereby the older the participants, the higher the prevalence among them. The trend is similar to the national HIV prevalence (MDHS 2015-16)

### Female Sex Workers Profile

There were 3,103 FSW in the study among these 8.3% belonged to a young age group of 15-19 years, 76.3% to the middle age group of 20-34 and 15.5% were 35 years and older.

According to school attendance, 30.7% of FSW had secondary school or higher, 61.1% had primary school while 8.15% had not attended any education level.

Half of the Female Sex Workers, that is (53.9%) were either divorced or separated, 40.4% were never married 4.6% were widowed while 2.1% were currently married.

Table 1 above shows that HIV prevalence among Female Sex Workers was 49.9% while Syphilis prevalence was 32.6%.

The average number of unpaid male sex partners was found out to be 2 and 52% of females sex workers reported to have at least a main male unpaid partner while 26% reported to have a main paid male partner.

The findings show that close to half of the Female Sex Workers (48.4%) reported that they always use condom during vaginal sex with clients and 53.5% reported that sometimes a condom broke or slip off during vaginal sex.

On population size estimation, the 2019-2020 BBSS estimates that in Malawi there are approximately 36,100 Female Sex Workers with 35,500 to 37,100 as confidence bounds at 95% level of confidence. By region, there are 5,700, 16,200 and 14,300 women who engaged in sex work in the North, Central and Southern regions respectively.

### **Men who have Sex with Men Profile**

There were 1,965 MSM in the study, among these 10.2% belonged to a young age group of 15-19 years, 76.7% to the middle age group of 20-34 and 13.1% were 35 years and older.

HIV prevalence among Men who have Sex with Men MSM was 12.8% while Syphilis prevalence was 9.0%.

The 2019-2020 BBSS has found out that 58.1% of MSM had attended secondary school or higher, 41.9% had attended primary or not attended any education level.

According to marital status of MSM, 62.1% reported that they have never married, 16.6% currently married, while 12.5% reported to have a stable male partner and 1.9% to have a stable female partner and 6.6% were either divorced or widowed.

Close to two thirds of MSM (64.3%) reported that their sexual orientation is Gay/Homosexual, while 34.4% identified themselves as Bisexual and 1.3% identified as Heterosexual.

On gender identity, 79.34% identified themselves as male, 16.1% identified as female and about 4.5% identified as Transgender.

During last receptive anal sex with a regular partner, 79.4% of MSM used a condom while 79.2% used a condom during insertive anal sex with a regular partner. During last vaginal sex with a regular female partner prior to the survey, 70.7% MSM, reported to have used a condom

In the 2020 BBSS, 9.7% of MSM reported to have ever used drugs like heroin and cocaine in the past 3 months. Out of these, 36.3% reported to have shared needles when injecting drugs

On population size estimation, the 2019-2020 BBSS estimates that in Malawi there are approximately 23,200 Men who have Sex with Men with 22,400 to 24,100 as confidence bounds at 95% level of confidence. By region, there are 2,200, 10,500 and 10,500 Men who have Sex with Men in the North, Central and Southern regions respectively.

## **Client of Female Sex Worker Profile**

There were 2,223 CoFSW of which 5.2% belonged to a young age group of 15-19 years, 69.6% to the middle age group of 20-34 and 25.2% were 35 years and older.

HIV prevalence among Clients of Female Sex Workers was 12.1% while Syphilis prevalence was 7.2%.

The findings on school attendance for CoFSW was 47.1% had attended secondary school or higher, 46% had attended primary school while 6.6% had not attended any education level.

According to marital status of CoFSW, half (52%) were currently married, 36.7% never married, 11.3% were either divorced or separated or widowed.

In the past 3 months preceding the survey, CoFSW had an average of 4 vaginal sex with different Female Sex Workers. In the last vaginal sex with a FSW, 68.9% of CoFSW used a condom.

## **HIV Prevalence**

The study reported a drop in HIV prevalence among key populations of FSW and CoFSW in the 2019-2020 BBSS compare to 2013-2014 BBSS but it is still remains high. Some districts have registered highest figures of HIV prevalence rate which are above national estimates of three surveyed key population categories. Female Sex Workers were nationally reported to have the highest prevalence rate 49.9% from 62.7% in 2013 BBSS, seconded by Men who have Sex with Men 12.8% and lowest was Clients of Female Sex Workers 12.1% from 16.2% in 2013 BBSS.

By district, Blantyre 57.1% is reported to have the highest prevalence among FSW followed by Mchinji (56.5%) and Mwanza (54.2%) that are above national estimate Nkhata Bay 40.3% has the lowest HIV prevalence among the Female Sex Workers.

Men who have Sex with Men 12.8% HIV prevalence stand out as the second key population which have the highest national estimate from Female Sex Workers 49.9%. Mangochi (24.8%) is reported to have the highest HIV prevalence above national estimate of Men who have Sex with Men and seconded by Blantyre (16.1%). Karonga (2.4%) has the lowest HIV prevalence among Men who have Sex with Men.

Clients to Female Sex Workers are one of the key populations of interest having national estimate of 12.1% scoring above national HIV prevalence rate of 10.6%. Mchinji has registered the highest HIV prevalence at 18.1%, followed by Zomba (17.4%) and Karonga (15%). Mangochi (7.4%) has recorded the lowest HIV prevalence among clients to Female Sex Workers.

## **Syphilis Prevalence**

Syphilis prevalence is noted as a proxy indicator of HIV prevalence among the study population. The study has found out that national estimates of syphilis prevalence is higher in FSW 32.6% than MSM 9.0% and clients of FSW 7.2% among key populations.



At district level and Female Sex Workers, Mchinji has the highest syphilis prevalence at 45.1%; and followed by Blantyre 39.7% and Lilongwe 37.29%. Mwanza 22.1% has registered the lowest syphilis prevalence rate.

According to syphilis analysis for Men who have Sex with other Men, Blantyre 12.7% has the highest syphilis prevalence rate, seconded by Mangochi 11.4%. Karonga has emerged as the district with the lowest syphilis prevalence of 3.5%.

Clients of Female Sex Workers have a national prevalence rate of 7.2% with Mchinji having the highest prevalence at 13% followed by Zomba 10% and Nkhata Bay was the least with prevalence rate of 2.3%.

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# **1 Introduction**

## **1.1 Current HIV and AIDS Situation in Malawi**

Malawi is among the countries in Southern Africa with the highest HIV burden. According to 2015-16 Malawi Demographic and Health Survey, HIV prevalence among adults 15 to 49 years is 8.8 % (10.8% for females and 6.4% for males. This is a decline from the 2010 Malawi Demographic and Health Survey results that showed that the national HIV prevalence rate among adults (15-49 years) was estimated at 11%. There are about 1,082,608 people living with HIV (PLHIV) (609,369 females and 409,569 males above 15 years respectively).

Malawi has made great strides towards epidemic control largely through a well-coordinated multi-sectoral response. These efforts have contributed to a significant decline in the number of new infections from 111,000 in 1992 to 52,229 in 2010 to 36,000 in 2020. The AIDS deaths have decreased from 71,000 in 2004 to 13,100 in 2020.

In order to achieve an AIDS-free generation, the UNAIDS set an ambitious target code named 90-90-90, which aims to ensure that 90% of all people living with HIV will know their status, 90% of all people diagnosed will receive sustained antiretroviral therapy (ART), and 90% of all people receiving ART will have viral suppression, all by 2020. Progress on 90:90:90 UNAIDS Fast-Track targets in Malawi was at 91:87:94 by the end of June 2020. Since the introduction of Option B+ in 2011, 76,420 paediatric infections have been averted. By 2019, the transmission rates decreased to 2% at 6 weeks after birth and 7.6% at the end of the breastfeeding period, resulting in 3,336 new infections among children.

The 2015-16 DHS showed that HIV prevalence was 8.8% for women and men age 15-49 in Malawi are infected with HIV. HIV prevalence looked higher among women than men (10.8% versus 6.4%). The 2015-16 DHS also showed that HIV prevalence was twice as high in urban areas than in rural areas (14.6% versus 7.4%). According to regions HIV prevalence in the Southern region (12.8%) was more than twice as high as in the Northern (5.1%) and Central (5.6%) regions. HIV prevalence among young people was 4.9% among young women and 1% among young men age 15-24 (2015-16 MDHS).

The results from the Malawi DHS further suggest that knowledge of HIV prevention methods in Malawi has been increasing. In 2015-16 DHS, the total percentage of women who knew that using condoms and limiting sexual intercourse could prevent HIV spread was at 69.5% while that of men was at 70.2%. In 2015, about 70 percent of women and men knew that HIV could be prevented by using a condom and by limiting the number of sexual partners, an increase from 66% in 2010. (NSO & ICF Macro, 2011, NSO & ICF 2016). However, knowledge has not always translated into behaviour change in the general population with only 27% of women and 25% of men who reported having two or more partners having used a condom at last sexual intercourse in 2010 (NSO & ICF Macro, 2011). This trend improved slightly during the 2016 DHS with 27.2 percent for women and 29.7 percent for men.



## **1.2 HIV Situation of High-Risk and Vulnerable Populations in Malawi**

Populations at increased risk, or most-at-risk, for HIV are often referred to as ‘hidden’ or ‘hard-to-reach’. These populations are composed of individuals who engage in behaviours that are sometimes illegal or stigmatizing so these populations tend to avoid disclosure. Populations most at risk to HIV are often reluctant to participate in activities or programmes that may personally identify them. The BBSS in 2020 picked three key populations and these are Female Sex Workers, (FSW), Men who have Sex with Men (MSM) and Clients of Female Sex Workers (CoFSW). These populations were targeted because they are key to the epidemic as their HIV prevalence is consistently higher than in the general population. For instance, HIV prevalence among Female Sex Workers of 18 years and above is estimated at 55% while that of Men who have Sex with Men of ages 15 to 49 years is estimated at 7%. In addition, these targeted population groups are associated with high levels of HIV infection risk related behaviours such as use of drugs and unprotected sex. Deliberate targeting of key populations in HIV prevention is key to efforts in reducing new infections that are currently at 36,000 per year. Arguments to implement prevention, care and treatment programmes are more compelling when good estimates of sizes of at-risk populations are available. The estimates of size must be based on sound methods that can be widely accepted and easily replicated.

## **1.3 Estimation of Female Sex Worker and Men who have Sex with Men Population in Malawi**

One of the objectives of the BBSS study is to estimate the number of sex workers and Men who have Sex with Men in the country. To achieve this objective, Female Sex Worker and MSM estimation component was included in the 2019-2020 BBSS which was conducted using 2 stage capture- recapture method. First step in this survey was to conduct a formative study to find out all possible venues that sex workers were trading and MSM’s community contacts like peer educators and RDS interview sites. This was done during the mapping of venues for the Clients of Female Sex Workers. Note that mapping was not conducted in Blantyre as this district was added after the mapping phase was completed. Mapping provided local contacts and target areas for unique object distribution for each population. The unique objects, which were two different bracelets for each key population (green for FSW and blue for MSM) were distributed at the beginning of the study as first capture. The second capture included questions in the survey questionnaire about receiving the unique object including whether they had the bracelet with them and could show it to the interviewers or if they could accurately point to a picture of the bracelet.

Using this information methods were developed for estimating national population size of FSW and MSM in Malawi. The information generated provides data that can guide program planning and interventions for Female Sex Workers and Men who have Sex with Men in the country.

## **1.4 Target Group Definitions**

The study had three target populations defined as follows:

### **Female Sex Workers (FSW)**

For purposes of this survey, a Female Sex Worker, is defined as any female 15 years and above who received money in exchange for sex at least once in the last 12 months. Since it has been observed that there are also Female Sex Workers below the age of 18, emancipated minors were also enrolled in the study. Because sex work involves multiple partner exchange and FSW often have limited power in negotiating safe sex, FSW are considered to be at a higher risk of contracting and transmitting HIV.

FSW in Malawi are believed to generally fall into three main categories:

- a) Bar-based FSW - women who are paid by bar owners to work as barmaids, but who are also expected to perform sex work and pick up clients at certain times.
- b) Venue-based FSW – women who travel to areas more advantageous to performing sex work. They go into bars, bottle stores, hotels, clubs, and other venues to pick up clients.
- c) Street-corner FSW – women who stand by the roadside, at the entrance of hotels, and other major entertainment places to pick up clients.

### **Men who have Sex with Men (MSM)**

In this survey, an MSM is defined as any male 15 years and above who has engaged in sexual activities with other men in the past 12 months. This target group is considered to be at a higher risk of contracting and transmitting HIV because of the elevated biological risk of HIV transmission through unprotected anal sex, multiple partnerships, and the potential for riskier sexual behaviour due to the stigma and discrimination attached to male-to-male sex.

This group is important to be included in the BBSS as there are limited studies targeted at them in Malawi, and little is known about the extent to which they contribute to the epidemic.

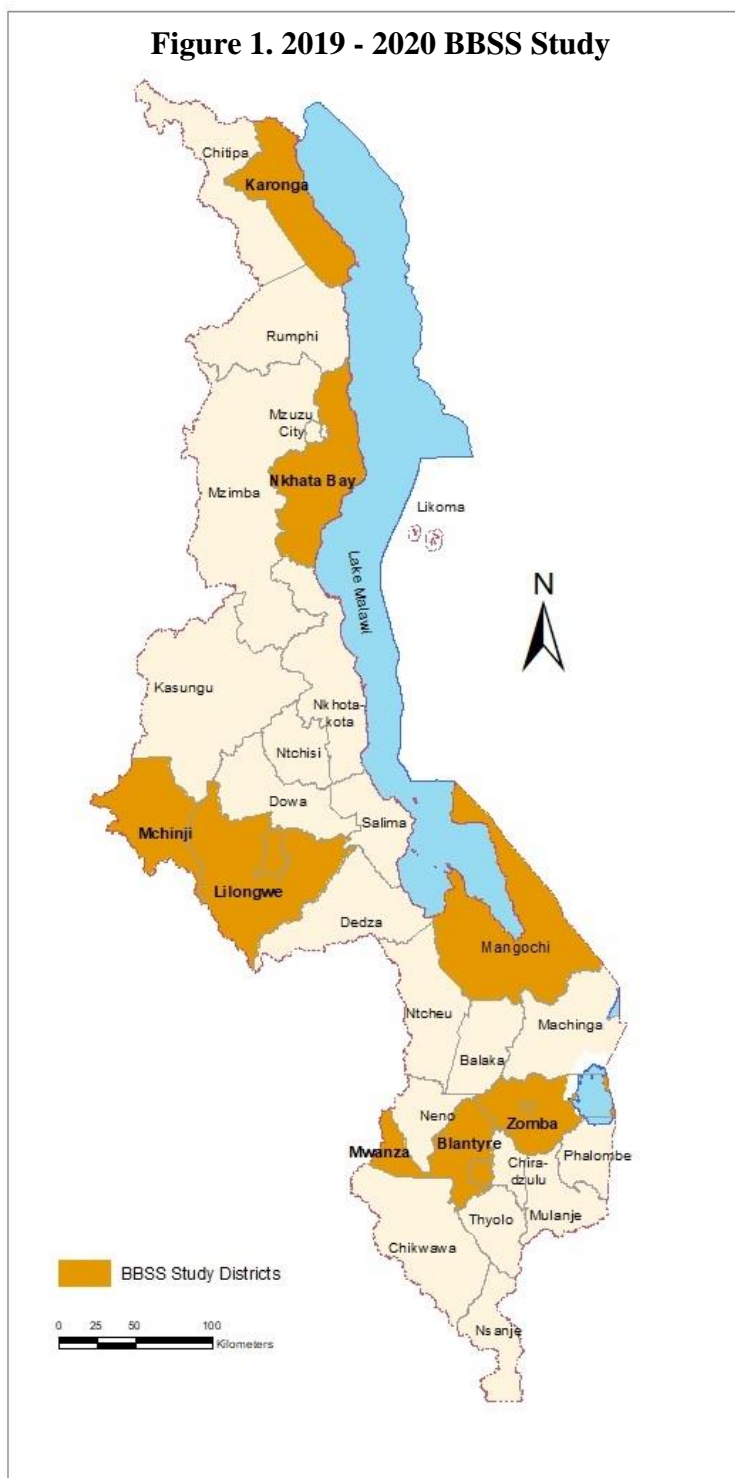
### **Clients of Female Sex Workers**

For purposes of this survey, a client of sex worker is defined as a man or boy aged 18 years or more who pay Female Sex Workers in exchange for sex and have bought sex at least once in the last 12 months. Clients of sex workers were included in this survey because they are at an increased risk for HIV infection due to engaging in high-risk behaviours. They are considered to be at an increased risk for HIV infection due to their engagement in sexual behaviour with Female Sex Workers who are one of the core groups driving the epidemic because of their high HIV infection rates (49.9%), exposure to multiple sexual partners and increased likelihood of transmitting the virus to others. This group is important as there are limited studies targeted at them, and little is known about the extent to which they contribute to the epidemic.

## 1.5 Target Sites and Selection

Unlike the previous BBSS of 2004, 2006 and 2013 which had 13 target populations and 9 Districts selected, the 2019-2020 BBSS targeted 3 population groups and sampled 8 districts. The target groups were selected because they were considered to be at high risk and/or vulnerable of being infected with or transmitting HIV and AIDS. The selected districts were Karonga, Nkhata Bay, Mchinji, Lilongwe, Mangochi, Zomba, Blantyre and Mwanza. These districts were selected after discussions with the BBSS TWG regarding the likely locations to access the target groups. The target populations were sampled only in the study districts where it was known that the population resides, travels to, or could be captured-thus, not all target groups were sampled in all the selected districts. In general, the districts were selected based on the following selection criteria:

- **Level of Socioeconomic Activity:** Areas with higher levels of commercial activities (e.g. tourism) have higher levels of interaction and increased probability of people engaging in risky sexual activities such as having multiple partners. People who are economically advantaged are more likely to use disposable income to buy sex while the economically underprivileged are more likely to use sex for financial gain and to seek other favours.
- **Population Density:** Generally, areas with high population density are characterized by high levels of economic disparity. The economic status of many households is low, with high levels of illiteracy. These factors may influence people to be involved in risky sexual behaviours as they search for



alternatives to supplement their incomes. This may put them at a higher risk of contracting HIV and other STIs.

## **1.6 Sampling Procedures for the BBSS**

The 2019-2020 Biological and Behavioural Surveillance Survey aims to provide up-to-date information on HIV and STI sero-prevalence and track behavioural trends of MSM, FSW, and CoFSW. These sub-populations have been chosen for this study because of their key role in the HIV epidemic emanating from the high-risk sexual behaviours.

In this study, two sampling methodologies (Respondent Driven Sampling and Time-Location Sampling) were used to sample, identify and recruit members of the sub populations for data collection. This approach is justified by variability among these sub-populations of interest and more importantly, distinctiveness of these sub-populations from the general population.

### **1.6.1 Sampling methodology for MSM and FSW**

Research has shown that individuals that engage in illegal or stigmatized behaviors tend to be difficult to reach though they have centres or spots where they are concentrated. These populations include illicit drug users, sex workers and Men who have Sex with Men.

The 2019-2020 BBSS used Respondent Driven Sampling (RDS) technique to identify and recruit members of the sub-population of men that have sex with other men as well as Female Sex Workers due to the nature of their activities as well as stigma and discrimination. The RDS approach involved identifying a specified initial number of members of the sub-population who served as “seeds” for identifying other “leads” or other members of subgroup of interest whilst observing inclusion criteria defined for the study. Review of sampling hard-to-reach and hidden populations for HIV surveillance noted that peers are better placed to recruit members of a hidden population than investigators. The leads from seeds, in turn, will be required to recruit other members of the subgroup members until the required sample size is reached or data saturation point is reached (i.e. no leads from a certain wave provide new or different information from what has already been gathered).

Since for MSM and FSW study the main goal is to establish district estimates, probability proportional to size (PPS) sample allocation technique was applied to distribute the sample size within each selected district.

The first wave of seeds were identified through key population structures such as peer educators and in some instances members of sub-population.

Each seed member was interviewed using a screening form. Those who met the study eligibility criteria were interviewed, tested for HIV and Syphilis and finally provided coupons that they used to recruit other members of the sub-population. The “leads” or recruits in turn were given coupons for them to recruit other members of the sub-population of interest. In this way, the sample grew through many waves hence, all the participants were recruited by other respondents

and not by researchers or field personnel. This minimized bias or negligent convenience targeting thereby contributing positively to success of RDS methodology.

## 1.6.2 Sampling methodology for CoFSW

The study utilized two dimensions for each primary sampling unit (PSU) in time-location sampling, i.e., place and time. A mapping of venues that clients of Female Sex Workers are found and time when the population is found in large numbers for each site was done prior to data collection exercise. The following are the steps that were followed:

1. The sampling frame was made up of the venue-day-time (VDT) periods.
2. Then venues were randomly selected.
3. A sampling calendar was created by scheduling those with the least number of VDTs first and those with the most number of VDTs last. This was to ensure that those with the least VDT options will make it on to the calendar and be sampled.
4. VDTs were chosen randomly among those venues with more than one VDT.
5. Once the predetermined number of VDTs were selected and scheduled, alternates were selected. This was be done by:
  - a) Making a list of those venues that have VDTs at approximately the same time as the originally scheduled event.
  - b) Randomly choosing two alternate venues from the list for each originally scheduled event.
  - c) Note: Alternates were only used when the VDT is not safe, venue is closed and if no respondent has been selected in more than an hour.

For Clients of Female Sex Workers, time location sampling (TLS) was employed to identify and recruit participants for this study. Using a screening form, research assistants randomly identified eligible participants in each of the selected venues.

**Table 2. Target Population and Sample Size**

District	Female Sex Worker	Men who have Sex Men	Clients of Female Sex Worker
<b>Karonga</b>	226	85	447
<b>Nkhata Bay</b>	305	184	177
<b>Mchinji</b>	386	-	177
<b>Lilongwe</b>	472	582	660
<b>Mangochi</b>	306	298	312
<b>Blantyre</b>	375	440	-
<b>Zomba</b>	594	376	450
<b>Mwanza</b>	439	-	-
<b>Total</b>	<b>3,103</b>	<b>1,965</b>	<b>2,223</b>

## 2 Female Sex Workers

### 2.1 Introduction to Female Sex Worker Study

The current chapter summarizes results of the Female Sex Workers (FSW) study. It starts with Demographic Characteristics of FSW then present results on sexual behaviour. This chapter further highlights on use of condoms and lubricants, access to reproductive health services and HIV prevention services and ART.

It also looked at self-reported HIV status and viral load, self-reported STIs and presents HIV and syphilis prevalence. This chapter concludes with effect of COVID-19 pandemic on FSW in Malawi.

### 2.2 Demographic Characteristics of Female Sex Workers

The study involved 3,103 Female Sex Workers of which 29.8% were 20-24 years and 29.0% were 25-29 years. The proportion of FSW aged 20-24 was lower than the 2013 BBSS (39.5%). The percentage of FSW aged between 15-19 years has reduced from 13.6% in 2013 BBSS to 8.3% in 2020 BBSS.

**Table 3: Female Sex Workers Demographic Characteristics**

Background variable	Female Sex Workers	
	2013	2020
<b>Age Group</b>		
15 – 19	13.6	8.3
20 - 24	39.5	29.8
25 – 29	28.3	29.0
30 – 34	12.7	17.4
35+	5.9	15.5
<b>Highest Education Level Attained</b>		
None/Primary	70.4	69.3
Secondary +	29.6	30.9
<b>Marital Status</b>		
Married	4.7	2.1
Never Married	28.8	40.4
Divorced/Separated/Widowed	66.5	57.5
<b>Religion</b>		
Christian	97.6	86.2
Muslim	2.4	12.6
Other	0	1.1

In terms of school attendance 61.1% of the FSWs had primary school education level, 8.2% had never gone to school, 30.1% had gone secondary school and only 0.6% had more than Secondary education.

Out of the total FSWs, 86.2% were Christians, 12.6% were Muslims and 1.1% had other Religions.

In 2013 BBSS, 4.7% FSWs were married as compared with only 2.1% in 2020. Slightly more than half of FSW (57.5%) were divorced or separated a drop from 66.5% in 2013. The 2020 BBSS has seen an increase (40.0%) of FSW who have never married compared with the 2013 BBSS (28.8%).

On earnings per week, the study has showed that 44.99% were earning less MK 10,000, (33.6%) were earning between MK 10,000 and MK 25,000 (17.5%) were earning between MK 2500 and MK 50,000 and only 4% were earning between MK 50,000 and MK 75,000.

### **2.3 Sexual Behaviour among Female Sex Workers**

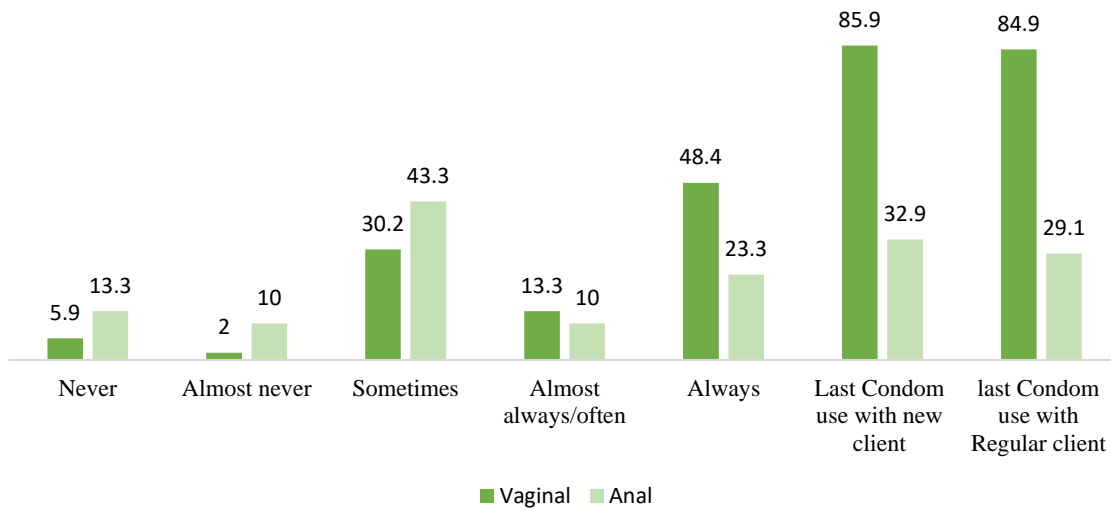
The mean age at first sexual encounter for Female Sex Workers was 15.4 years. Almost two thirds of them (64.1%) reported to have had their first sex between the age of 15 and 19 and only a few of them (0.3%) reported to have had their first sexual intercourse at a very young age of less than 10 years. Almost a third (31.9%) reported to have had their first sexual intercourse between the ages of 10 and 14. The study found that the average number of clients which Female Sex Workers have in a day was 4. The study further shows 3.8% of FSWs reported to have ever engaged in anal sex with clients.

### **2.4 Condom and Lubricant use among Female Sex Workers**

#### **2.4.1 Condom use in vaginal and anal sex**

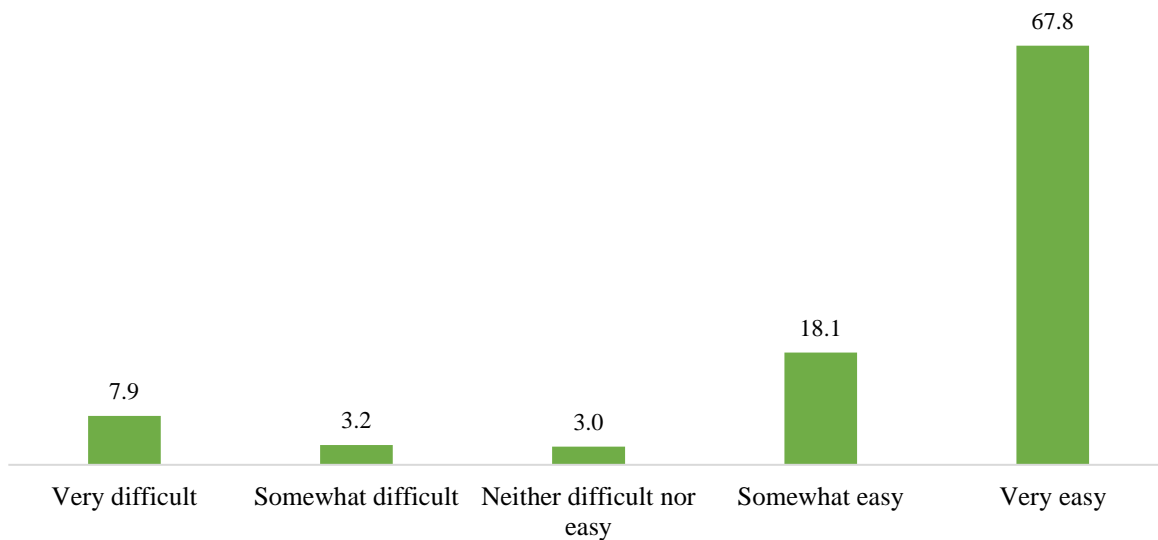
There was an inconsistency in condom use among FSW during anal sex compared with vaginal sex. Almost half (48.4%) of Female Sex Workers reported always using condoms during vaginal sex and only 5.9% reported to have “Never” used condoms with their clients during the previous 12 months. The majority of them (85.9%) reported to have used a condom during their last sex with new clients. Of the 3.8% of FSW who reported anal sex, only 23.3% of them reported to have always used condoms during anal sex and 43.3% reported to sometimes use condoms during anal sex in the past 12 months before the survey. The study also found that 39.9% of Female Sex Workers who had anal sex with a new client used condoms whilst about 67.1% of them did not use condoms when they had anal sex with a new client. 84.9% report to have used a condom during the last sex with regular clients. On condom use with a new client, 15.1% of Female Sex Workers reported that they did not use a condom the last they had vaginal sex.

**Figure 2: Frequency of Condom use in Vaginal Sex Vs Anal Sex Amongst Female Sex Workers**



In terms of access to condoms, 66.8% of FSW reported that they can easily access condoms, 18.1% somewhat difficult and 7.9% reported to find it difficult to access condoms. The majority of them (84.4%) reported to access condoms for free and only 7.6% reported to buy condoms with their sexual partners.

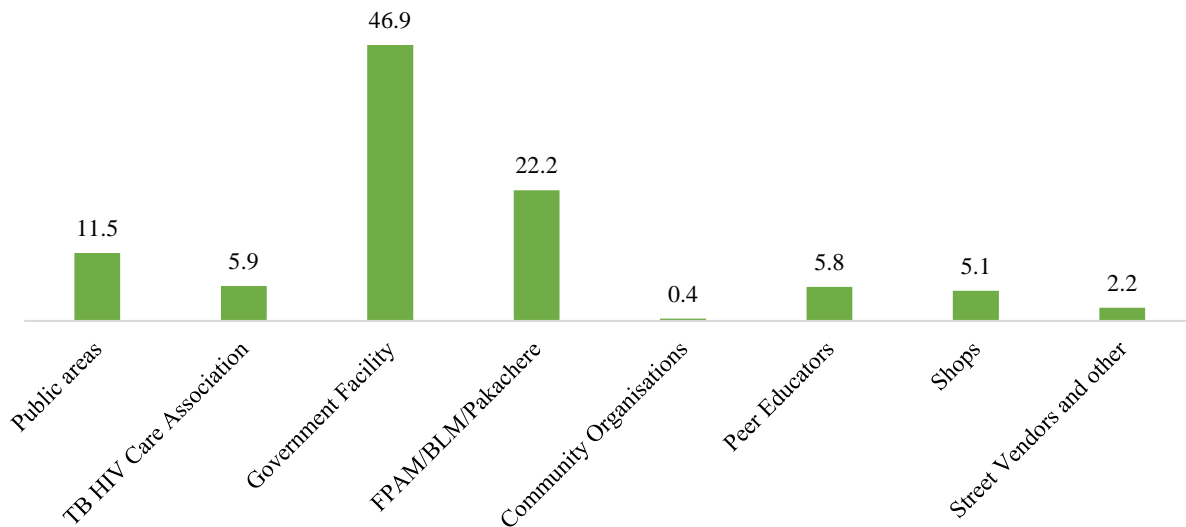
**Figure 3: Difficulty in accessing condoms among Female Sex Workers**





Close to half (46.86%) of Female Sex Workers reported that they access condoms from a government health facility followed by FPAM/BLM/Pakachere (22.17%) and 11.54% reported to access condoms from public areas such as bathrooms or clubs. More than half of FSW (55.2%) reported to always carry condoms with them and 3.69% reported to have ever re-used a condom

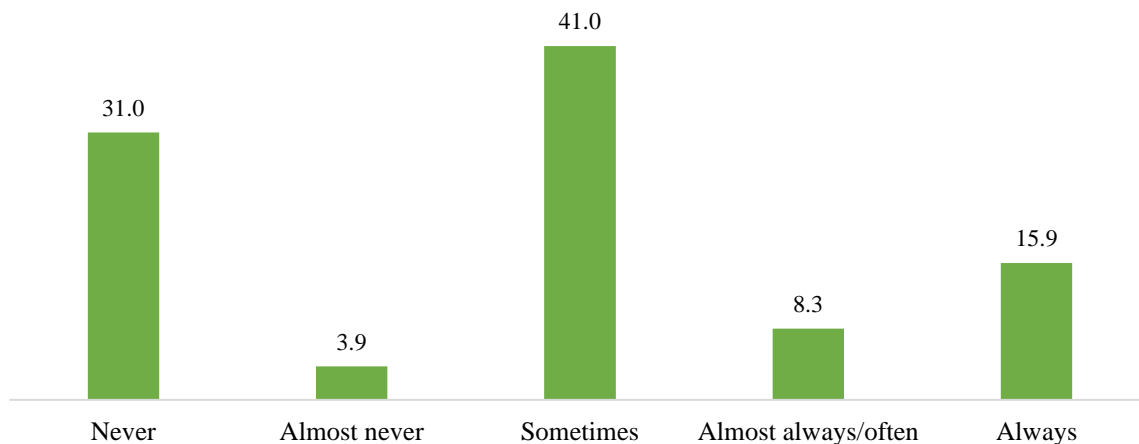
**Figure 4: Places where Female Sex Workers access condoms**



### 2.4.2 Use of Lubricant with Condom in Vaginal and Anal Sex among Female Sex Workers

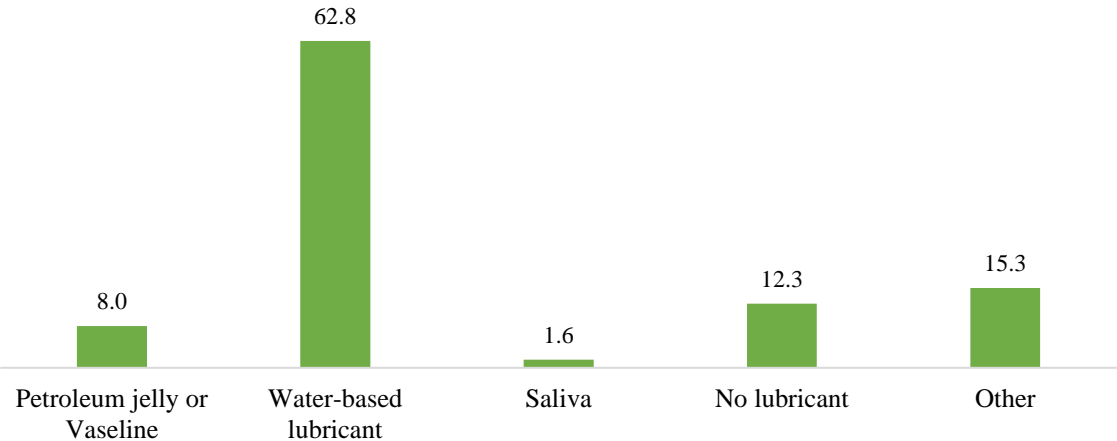
Female Sex Workers were asked questions about use of lubricant with condom during sexual encounter. About 69% of the FSW have ever used a lubricant with a condom. In particular 15.9% reported to always use lubricant with a condom when having sex with clients.

**Figure 5: Frequency of using Lubricant with Condom in Sex among Female Sex Workers**



Water-based Lubricant was commonly used by Female Sex Workers (62.8%) compared to petroleum jelly lubricant when having sex with clients (8%). In terms of lubricant accessibility, close to half (46%) Female Sex Workers reported that they are easily accessible as compare to condoms (67.8%).

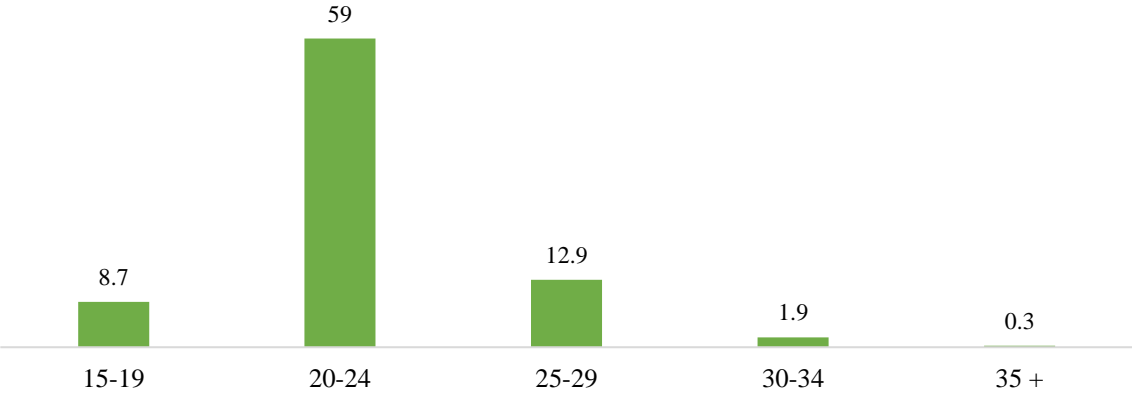
**Figure 6: Type of lubricant used during sex by Female Sex Workers**



**2.5 Reproductive Health among Female Sex Workers**

Female Sex Workers were asked some questions related to their reproductive health history. Among FSW the mean age for first pregnancy was 17 years. The data showed that 26.2% have been pregnant twice and 12.6% reported that they have never been pregnant before.

**Figure 7: Age at first childbirth**

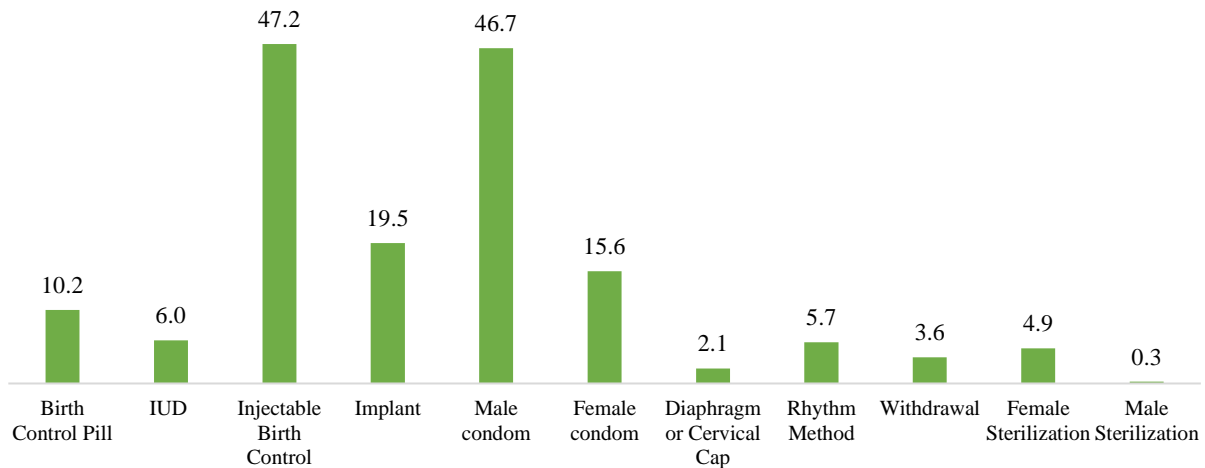


The majority of sex workers (59%) gave birth between the age of 20 and 24 years while 8.7% gave birth before the age of 20.

About 8.6% of Female Sex Workers reported to have ever had an abortion and of these, 66.7% aborted once while 23.9% had aborted two times.

Use of modern family planning methods was very high among FSW where 94.8% of them reported to have been using modern contraceptive methods including sterilization during the time of the survey. Injectable birth control like Depo provera (DMPA) and male condoms are the most used modern family planning methods (47.2% and 46.7% respectively).

**Figure 8: Modern family planning methods use among Female Sex Workers**

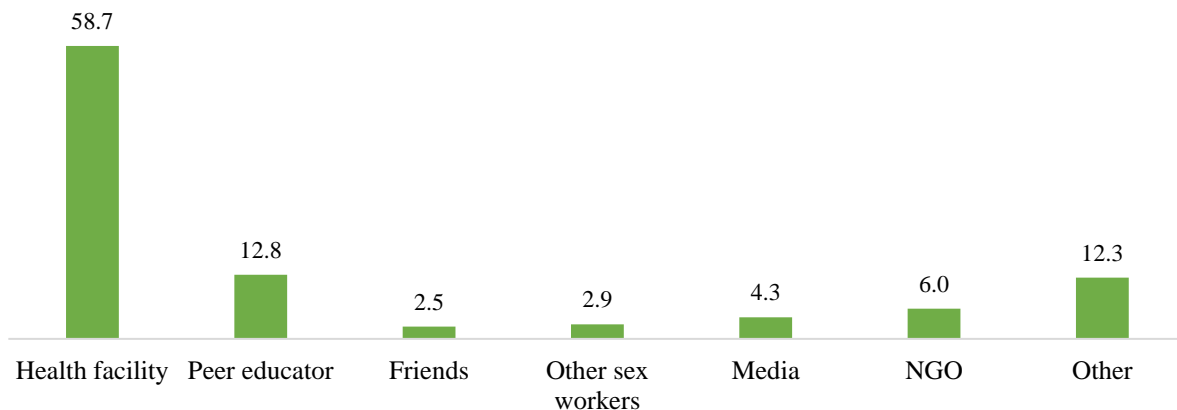


They were also asked some question to see whether they have ever gone for cervical cancer screening and 40.2% reported to have ever had a Pap smear before the survey.

## 2.6 Sources of HIV/AIDS prevention services and ART among Female Sex Workers

During the study FSWs were asked question on sources of HIV and ART information. About 58.7% of them reported to have received information about HIV testing from a health facility while 12.8% of them reported to have received information from their peer educators and 6% from NGOs.

**Figure 9: Source of HIV/AIDS prevention services and ART among Female Sex Workers**

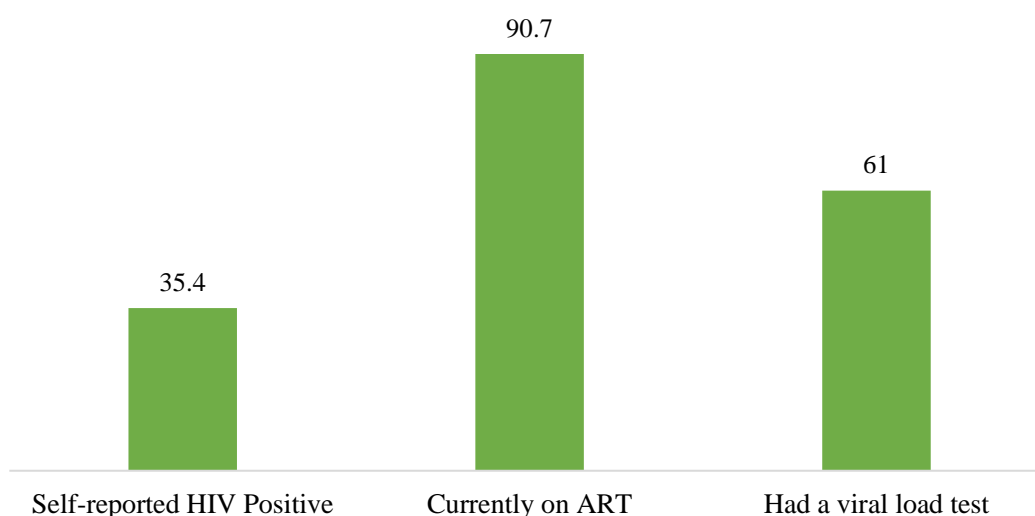


## 2.7 Self-reported HIV status and Viral Load among Female Sex Workers

Female Sex Workers were asked about whether they have ever been tested for HIV and received their test results from a health care provider. For those who were HIV positive were asked if they have ever taken ARVs and had a viral load test before the survey.

The study shows that 35.4% were told by the health care provider that they have HIV before the survey and 63.8% reported to have never been told that they have HIV. The survey further revealed that 90.7% of those who self-reported HIV positive status reported being on ART treatment and 61% reported to have ever had a viral load test.

**Figure 10: FSW Self-reported HIV Status, Currently on ART and had a Viral Load Test**

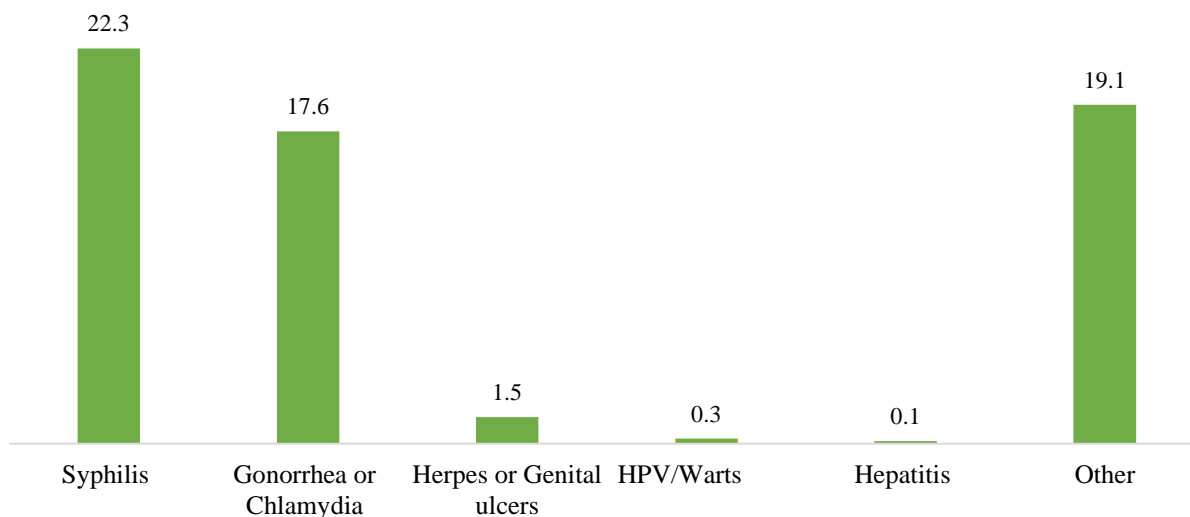


The study also found that disclosure of HIV status to sexual partners was low among Female Sex Workers. Close to 3 in every 4 FSWs (76.8%) have never discussed about their HIV status with a new sexual partner.

## 2.8 Self-reported Sexually Transmitted Infections (STI) Services among Female Sex Workers

Female Sex Workers were asked some questions about previous testing for STI. About 44% reported to had ever been tested for STI before the survey while 55.6% of them reported to have never been tested for STIs before the survey. Out of those who reported being tested before, 22.3% reported to have ever being told that they have syphilis, 17.6% reported to have been told that they have Gonorrhoea/Chlamydia and 19.1% reported to have been told having other STIs.

**Figure 11: Self-reported sexually transmitted infections among Female Sex Workers**



## 2.9 HIV prevalence among Female Sex Workers

During BBSS, FSWs were offered an HIV test and all 3,103 FSW (100%) accepted the test. The results showed that there has been a decrease in HIV prevalence among Female Sex Workers. In 2013 FSW HIV prevalence was 62.7% and it has decreased to 49.9% in 2020.

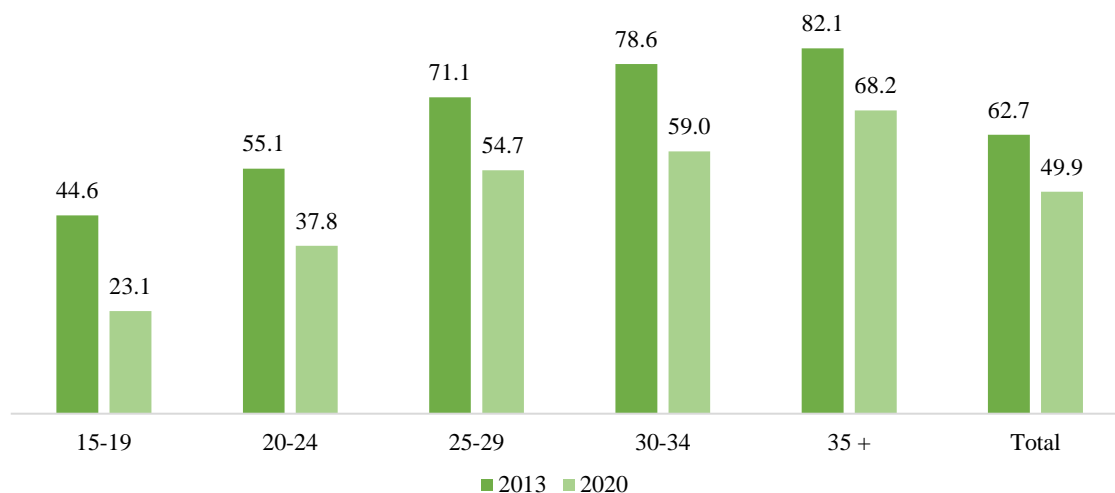
The prevalence was found to be high among older FSW aged above 35 years (68.2%) followed by those aged between 30 and 34 years (59%). The lowest HIV prevalence was recorded among FSWs aged between 15 and 19 years (23.1%). The data further shows that 27.7% of those FSWs who tested positive for HIV were diagnosed with HIV for the first time during this survey.

**Table 4: HIV Prevalence by age among Female Sex Workers**

Age Group	Tested HIV Positive	Tested HIV Positive First Time
<b>15-19</b>	23.1	18.1
<b>20-24</b>	37.8	21.5
<b>25-29</b>	54.7	32.6
<b>30-34</b>	59	30.5
<b>35 +</b>	68.2	40.9
<b>Total</b>	<b>49.9</b>	<b>27.7</b>

Comparing 2013 and 2020 BBSS, the trend in HIV prevalence by age is same where the prevalence increases with age of Female Sex Workers.

**Figure 12: HIV prevalence by age in 2013 and 2020 BBSS among Female Sex Workers**

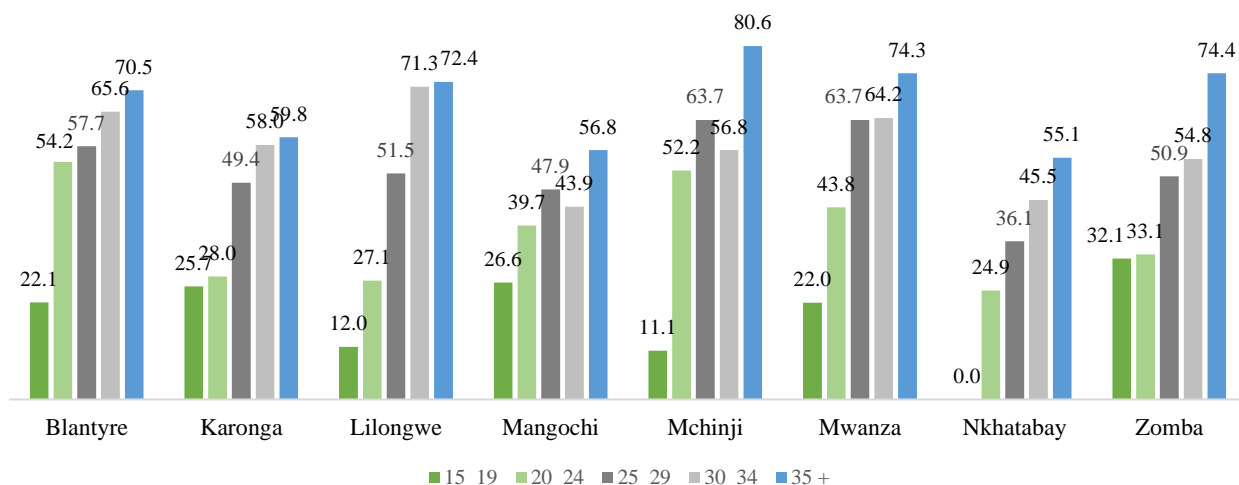


Across districts, HIV prevalence was highest in Blantyre (57.1%) followed by Mchinji (56.5%) and Mwanza (54.2%) while Nkhata Bay and Mangochi districts have lower HIV prevalence (40.3% and 44.8% respectively).

**Table 5: HIV prevalence by district among Female Sex Workers**

District	Tested HIV Positive
<b>Karonga</b>	49.6
<b>Nkhata Bay</b>	40.3
<b>Lilongwe</b>	48.3
<b>Mchinji</b>	56.5
<b>Mangochi</b>	44.8
<b>Zomba</b>	46.8
<b>Blantyre</b>	57.1
<b>Mwanza</b>	54.2
<b>Total</b>	<b>49.9</b>

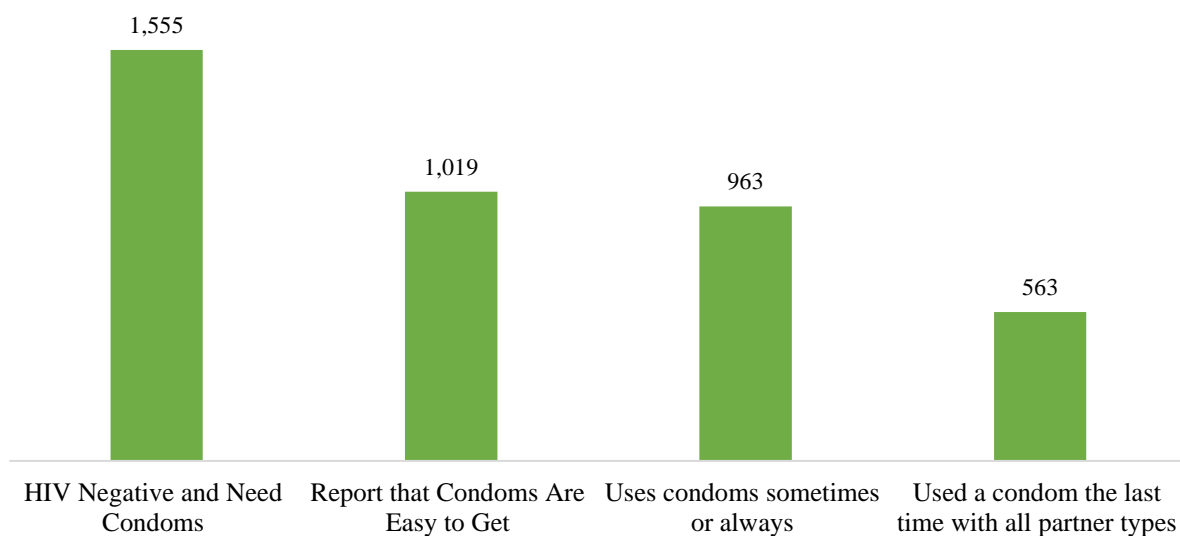
**Figure 13: HIV Prevalence by age, by district among Female Sex Workers**



The 2015-2020 National HIV Prevention Strategy strives to realize the UNAIDS’ “Three Zeros” goal and its overall goal of 70% reduction in new HIV infections by 2020 in Malawi. In reference to this background this study looked at the access and use of condoms among HIV negative FSW in the country.

Among the 1,555 HIV-negative FSW in the study, 1,019 reported that condoms were somewhat easy or easy to get. Of these, 963 reported using a condom sometimes, almost always or always. Of these, 563 reported using a condom the last time with each type of partner they had, including new, regular, casual and long-term partners in vaginal or anal sex.

**Figure 14: HIV Prevention Cascade: Condom Use, Female Sex Workers**



## 2.10 Syphilis prevalence among Female Sex Workers

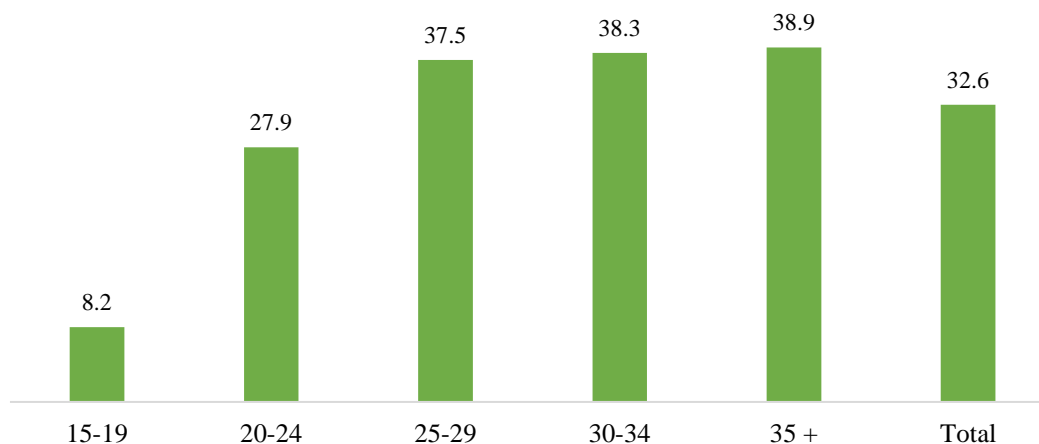
All FSWs were tested for syphilis in the 2020 BBSS. The data showed an increase in syphilis cases where 35.6% of Female Sex Workers tested were found to be syphilis positive compared with 20% in 2013 BBSS.

**Table 6: Syphilis prevalence by age among Female Sex Workers**

Age Group	Tested Syphilis Positive
15-19	8.2
20-24	27.9
25-29	37.5
30-34	38.3
35 +	38.9
<b>Total</b>	<b>32.6</b>

Syphilis prevalence is lower in young Female Sex Workers and increases as the ages increase.

**Figure 15: Syphilis prevalence by age among Female Sex Workers**



Across districts, syphilis prevalence among FSW was highest in Mchinji (45.1%) followed by Blantyre (39.7%) and then Mangochi (35.3%). Mwanza reported the lowest Syphilis positive cases (22.1%).



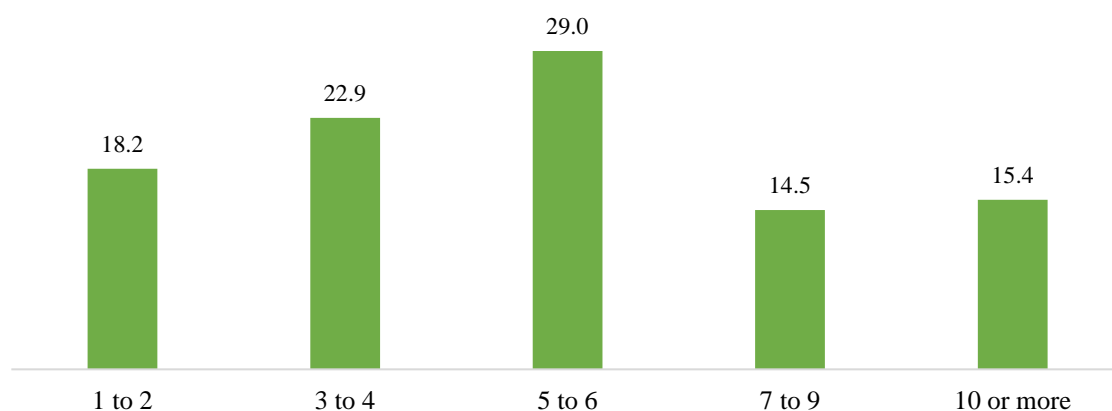
**Table 7: Syphilis prevalence by district among Female Sex Workers**

District	Tested Syphilis Positive
Karonga	24.3
Nkhata Bay	29.5
Lilongwe	37.3
Mchinji	45.1
Mangochi	35.3
Zomba	27.3
Blantyre	39.7
Mwanza	22.1
<b>Total</b>	<b>32.6</b>

### 2.11 Injecting drug use among Female Sex Workers

Majority of Female Sex Workers (98.4%) have never injected any illegal drugs. Similarly, 99.1% of them reported that they have never used an already used needle. Only 2.3% reported that their partners used a needle to inject them with drugs. In general, 14.4% of Female Sex Workers reported that they have ever used drugs and 12.4% used a drug in the past 12 months preceding the study. In terms of alcoholic drinks, 29% drinks 5 to 6 standard drinks while 15.4% drinks 10 or more.

**Figure 16: Number of standard alcoholic drinks per day among Female Sex Workers**

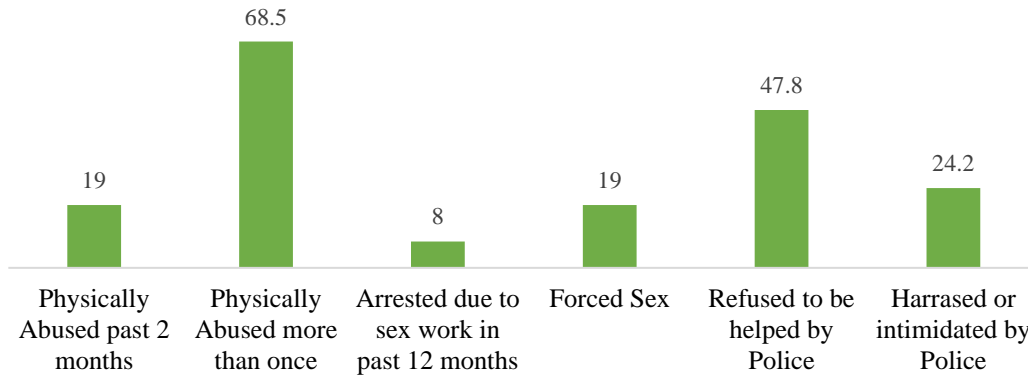


### 2.12 Human rights and exposure among Female Sex Workers

Due to the nature of sex work and stigma attached to it, the study asked Female Sex Workers questions about physical abuse and human rights. The results showed that 19% of FSW have ever been physically abused by someone in the past 2 months before the survey. Further, 68.5% of them reported to have been physically abused more than once. In addition, 8% of them

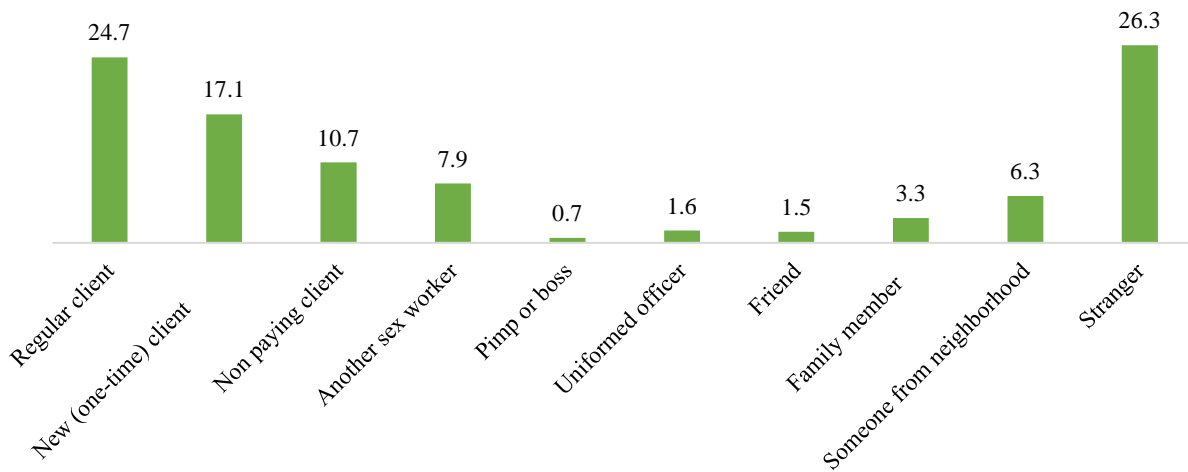
reported to have been arrested on charges related to sex work in the last 12 months. A total of 19% reported to have ever been forced to have sex when they did not want to and 83.6% reported that this happened after they had already started sex work while 20.7% reported to have been forced to have sex when they were still under 16 years of age. The majority of those forced to have sex, (85.7%) reported that they have been forced to have sex up to 5 times.

**Figure 17: Human rights and sexual abuse among Female Sex Workers**



A total of 47.8% felt that the police refused to protect them in any way because they practice sex work and 24.2% of FSW reported ever being harassed or intimidated by the police. In addition, 26% of those who reported to have been assaulted, the perpetrators have been strangers not known to them. Regular clients were the second (24.7%) on the list of the perpetrators of assault. Further, 25% of FSW reported to have been assaulted by their male sexual clients. The 2020 BBSS also revealed that there is still some stigma faced by FSW when they go to access care and treatment in the health facilities. A total of 49% reported to have ever been afraid of seeking health care services due to fear of stigma and 5.7% felt that they were not treated well by the health care providers.

**Figure 18: Perpetrators of sexual abuse among Female Sex Workers**



### **2.13 COVID-19 pandemic effect among Female Sex Workers**

During the data collection of the 2020 BBSS there was an emergence of Covid-19 as such questions related to Covid-19 were added and 639 FSWs were asked questions to assess their knowledge, exposure and adherence to covid-19 prevention measures. This was also done to assess how the pandemic has affected their daily sex work. The study found that the majority of Female Sex Workers live-in high-density areas where social distancing was difficult. 46 % of FSW reported staying in suburbs while 43% reported living in district towns. Of them, 68% reported were living in houses without fence where human traffic becomes difficult to control. Seventy nine percent of them reported living alone while 10% reported living with at least one person.

The study also shows that half of them (50.1%) reported not to have been able to follow all the Covid-19 preventive measures as recommended by the government. Only 31% reported to have washed their hands or used hand sanitizer at least 5 times the previous day and 94% reported to prefer hand washing only as Covid-19 Prevention method. A total of 60% reported to have not felt flu like symptoms while 38% of them reported to have felt flu like symptoms since the first Covid-19 case was identified in the country. Further, 73% reported to have either visited bars, restaurants or dancing places and 63% reported to have been in a car of more than 10 people in the last 10 days. In addition, 89% reported to have visited the market in the past 7 days and 71.3% of them reported to have had difficulties obtaining food in the past week with (94.3%) due to lack of money.

### 3 Men who have Sex with Men

#### 3.1 Introduction to Men who have Sex with Men study

The current chapter summarizes results of the Men who have Sex with Men (MSM) study. It starts with Demographic Characteristics of MSM then present results on sexual behaviour. This chapter further highlights on use of condoms and lubricants, human rights abuse and access to HIV prevention services and ART.

It also looked at self-reported HIV status and viral load, self-reported STIs and presents HIV and syphilis prevalence. This chapter concludes with effect of COVID-19 pandemic on MSM in Malawi.

#### 3.2 Demographic Characteristics of Men who have Sex with Men

A total of 1,965 Men who have Sex with Men were enrolled into the study out of which 10.2% were aged between 15 and 19 years, 41% were aged between 20 and 24 years. Out of the total respondents 99% were born in Malawi.

**Table 8: Men who have sex with Men Demographic Characteristics**

Background variable	Men who have Sex with Men
	<b>2020</b>
<b>Age Group</b>	
15 – 19	10.2
20 - 24	41.0
25 – 29	24.1
30 – 34	11.6
35+	13.1
<b>Highest Education Level Attained</b>	
None/Primary	41.9
Secondary +	58.1
<b>Marital Status</b>	
Married	16.6
Never Married	62.1
Divorced/Separated/Widowed	6.9
Stable male partner e.g. Boyfriend	12.5
Stable female partner e.g. Girlfriend	1.9
<b>Religion</b>	
Christian	76.8
Muslim	13.4
Other	9.7

In terms of education level, 58.1% of the participants attended secondary school or tertiary education and 41.9% either never went to school or attended primary school only.

Sixty two percent reported to have never been married while 16.6% were married, 12.5% had a stable male partner, 1.9% had a stable female partner and 6.9% were divorced, separated or widowed.

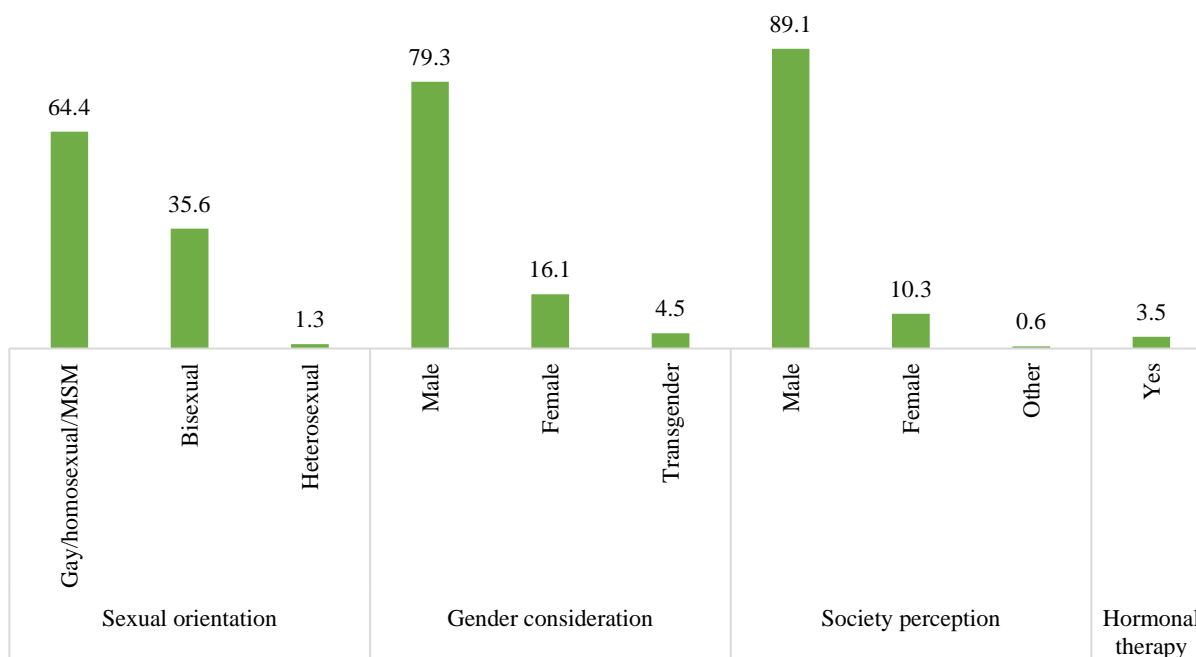
On income earnings, 29% reported earning less than MK10,000 while 19.2% were earning between MK 50,000 and MK 75,000 per week.

### 3.3 Sexual Behaviour among Men who have Sex with Men

The 2020 BBSS also established how MSM in Malawi identify themselves. Based on the study findings most MSM (64.4%) were Gay or Homosexual, 34.4% bisexual and 1.3% were heterosexuals. On gender consideration 79.3% of the MSM identified themselves as male. In terms of gender identity, 79.3% identified themselves as male, 16.1% as female while 4.5% identified as transgender. On the other hand, 89.1% reported that the society viewed them as men while 10.3% reported being seen as women while 10.3% reported being seen as women.

Only 3.5% reported to have taken some medications like hormonal therapy for them to feel like or look like a woman.

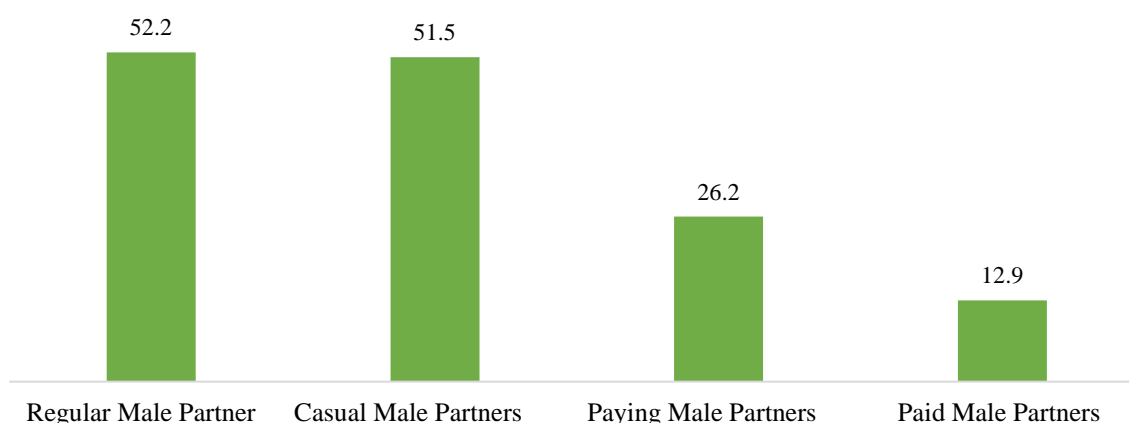
**Figure 19: Sexual orientation, Identity, society perception and hormonal therapy**



The mean age of Men who have Sex with Men encountering the first anal sex with a fellow man was 19.5 years. The study further revealed that the mean age at first anal sex with a woman was 17.9 years old.

On average MSM reported having more male sexual partners (2.4) compared with female sexual partners (1.3). Half of them (52.2%) reported having a main male sexual partner while 13.7% reported to having a main female sexual partner.

**Figure 20: Type of male sex partners when MSM travel outside their area**



The study showed that half of MSM have regular male partners (52.2%) and casual male partners (51.5%) when they go out of their area.

### **3.4 Use of Lubricant with Condom among Men who have Sex with Men**

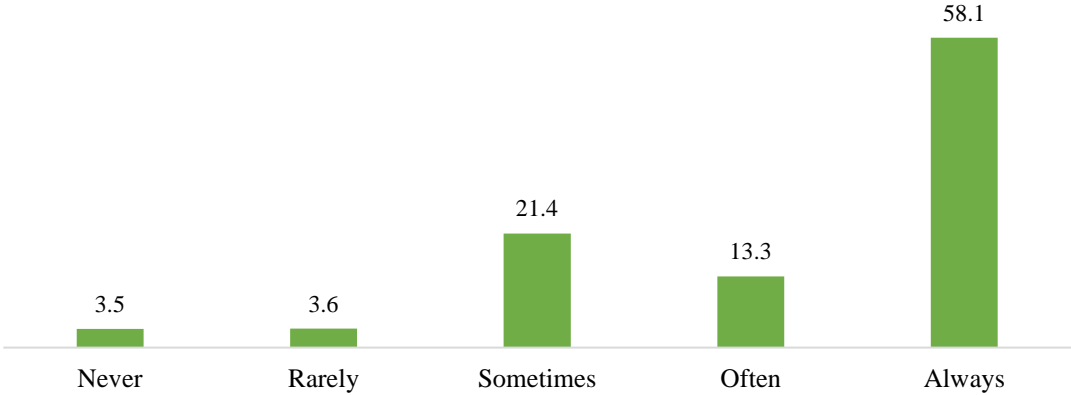
#### **3.4.1 Condom use in anal and vaginal sex among Men who have Sex with Men**

Use of condoms is an important factor in the reduction of HIV infection. During last receptive anal sex with a regular partner, 79.4% of MSM used a condom while 79.2% used a condom during insertive anal sex with a regular partner.

About 77.7% of Men who have Sex with Men indicated that circumcised men should use condoms to prevent HIV infection when having sex with women while 20.2% of Men who have Sex with Men were of the view that using condoms was not necessary for circumcised men when having sex with women.

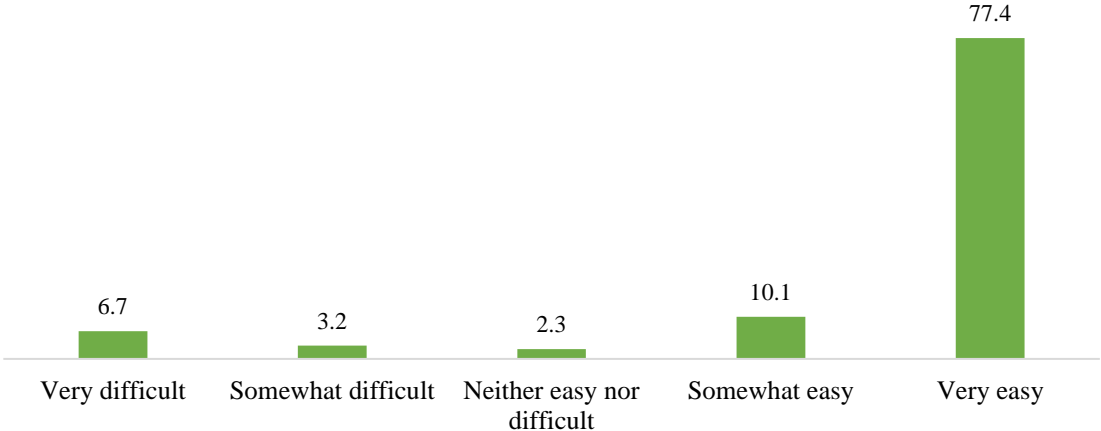
Condom use during last vaginal sex with a regular female partner prior to the survey, 70.7% MSM, reported to have used a condom.

**Figure 21: Use of lubricant with condom during anal sex among Men who have Sex with Men**



The study shows that 58.1% of MSM use lubricant with condom during anal sex with only 3.5% that have never used both together. About 21.4% of them sometimes use both condom and lubricant while 3.6% rarely use them

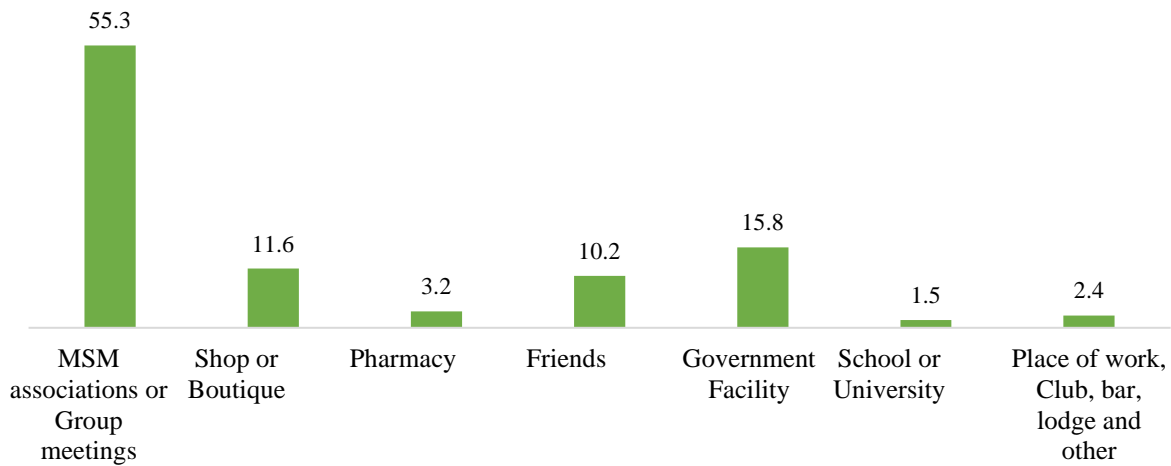
**Figure 22: Difficult in accessing condoms among Men who have Sex with Men**



Further, the study found that a majority of MSM (87.5%) had easy access to condoms from different sources. About 9.9% of MSM had difficulties in getting condoms. Of those that had challenges in condom access, 47.4% reported that condoms were too expensive for them to afford while 11.9% did not like condoms and 11.3% of them indicated lack of knowledge of where they could get condoms.

Unlike Female Sex Worker whom most of them access condoms from government health facilities, Men who have Sex with Men rely on MSM associations and group meetings. Over half of them (55.3%) rely on their associations to access condoms while only 15.8% get them from a government health facility.

**Figure 23: Places where Men who have Sex with Men access condoms**



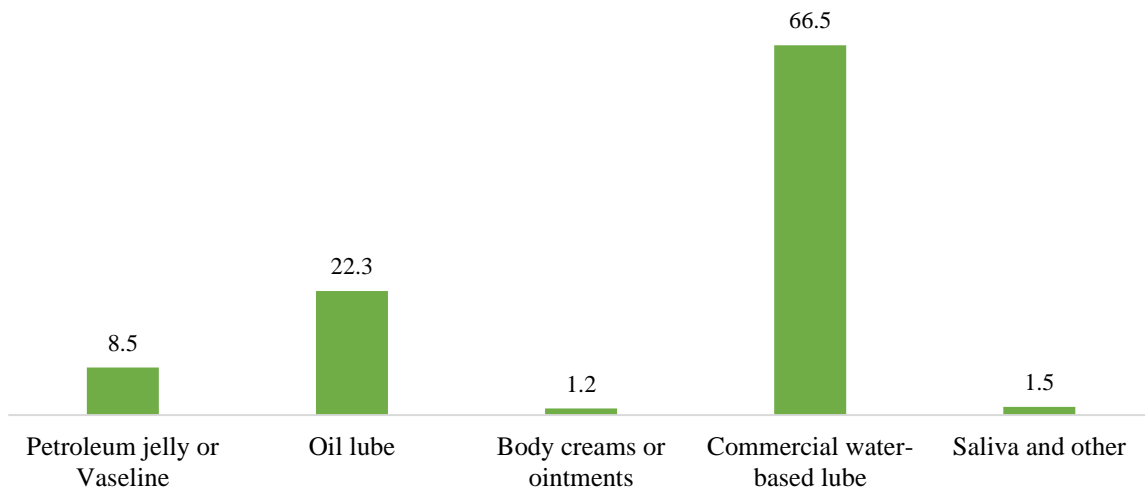
### 3.4.2 Lubricant use in anal sex among Men who have Sex with Men

Lubricants are mostly used in anal sex and MSM were asked about their use. The study shows that 78.6% of MSM have ever used lubricants during anal sex.

Commercial water-based lubricants are commonly used together with condoms and 66.5% of MSM reported their use. Oil lubricants were being used by about 22.3% while only 1.5% used saliva and other lubricants.

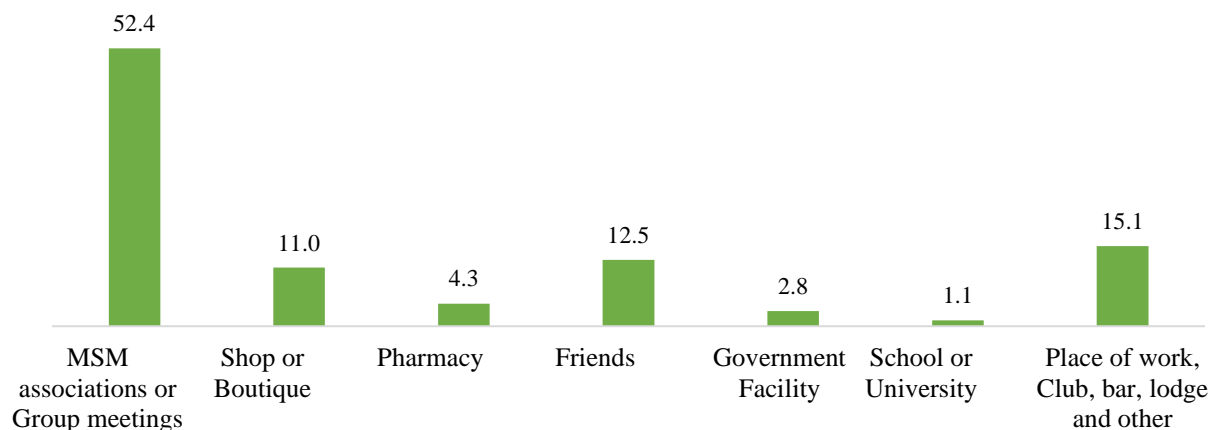
Just like where MSM mostly access condoms, half (52.4%) access commercial lubricants from MSM associations and group meetings. The study also showed that only 2.8% access commercial lubricants from a government health facility.

**Figure 24: Type of lubricant used with condom by Men who have Sex with Men**





**Figure 25: Places where MSM access commercial lubricants**

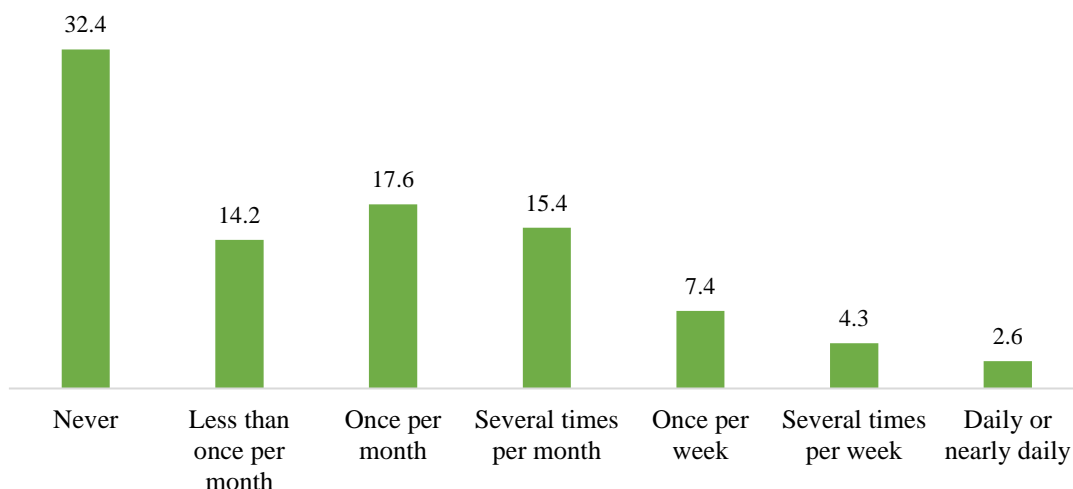


### 3.5 Participation in HIV prevention services among Men having Sex with Men

Among those MSM involved in anal sex, 79.4% had sought HIV testing services in the past 12 months prior to the survey from various sources avenues such as websites, radio programs and TV shows.

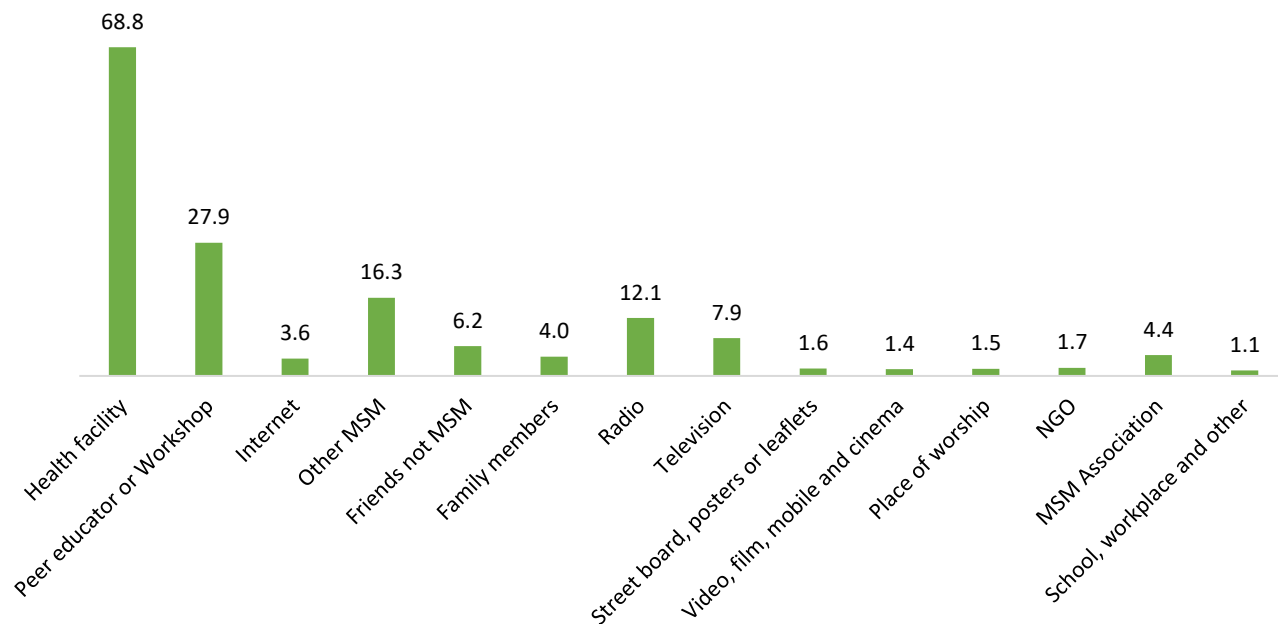
Participation in HIV prevention activities is low among MSM as only 17.6% reported participation once per month and 32.4% have never participated in any activity.

**Figure 26: Frequency of participation in HIV prevention activities among MSM**



Like Female Sex Workers, most MSM (68.8%) get HIV/AIDS prevention services from a health facility followed by peer educators and workshops (27.9%).

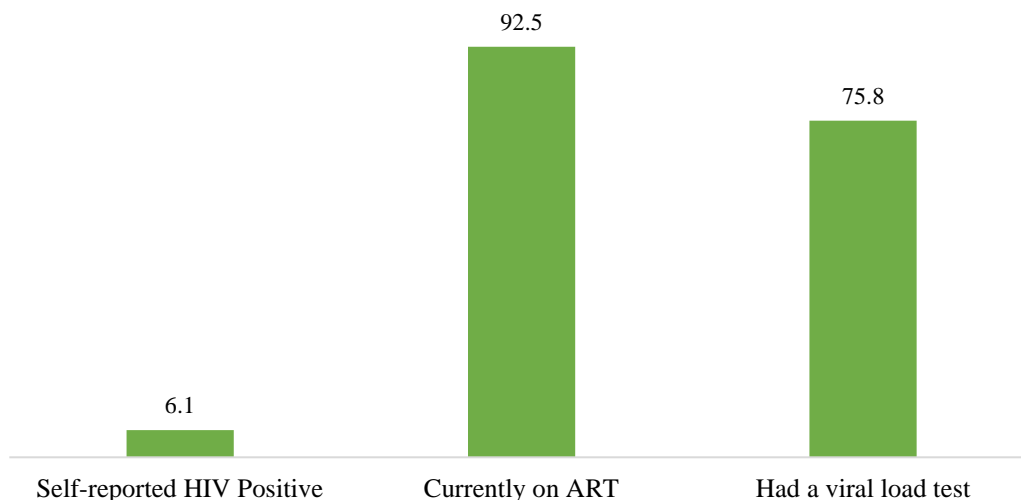
**Figure 27: Source of HIV/AIDS prevention services**



### 3.6 Self-reported HIV status and viral load among Men who have Sex with Men

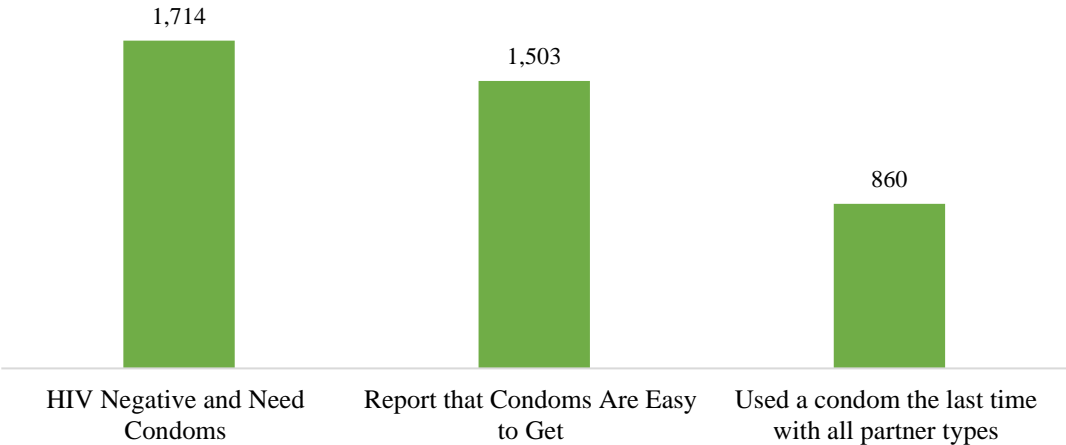
Men who sex with men were also asked about whether they have ever been tested for HIV and received their test results from a health care provider. They were also asked if they have ever taken ARVs and if they have ever had a viral load testing before the survey. The study shows that 6.1% were told by the health care provider that they have HIV before the survey. The survey further revealed that 92.5% of those who self-reported HIV positive status reported being on ART treatment and 75.8% reported to have ever had a viral load test.

**Figure 28: MSM Self-reported HIV Status, Currently on ART and had a Viral Load Test**



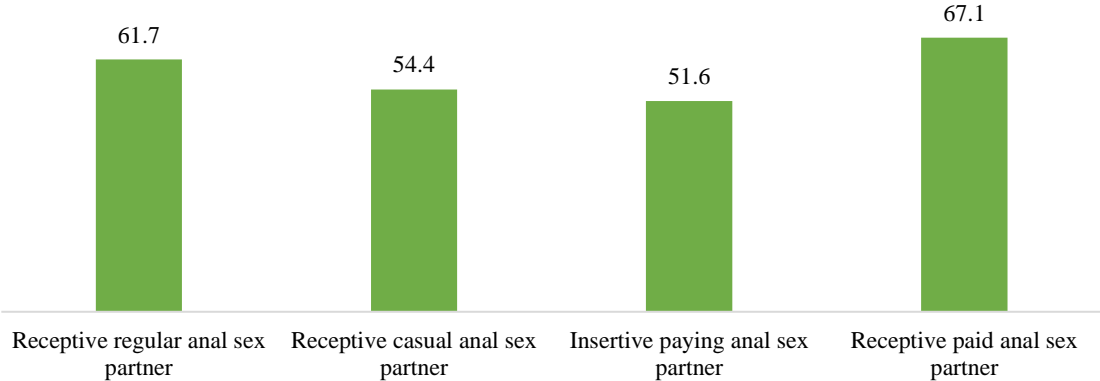
HIV-negative men need access to condoms. Among the 1,714 HIV-negative MSM in the study, 1,503 reported that condoms were somewhat easy or easy to get. Of these, 860 reported using a condom last time with each type of sexual partner they had, including male and female partners and during insertive anal, receptive anal and vaginal sex.

**Figure 29: HIV Prevention Cascade: Condom Use, Men who have Sex with other Men**



HIV status discussion with sexual partners among Men who have Sex with Men is high compared Female Sex Workers as (61.7%) reported to have talked about their HIV status with a regular male partner the last time they had receptive sex. Also, with a receptive paid anal sex partner, 67.1% reported to have discussed their HIV status.

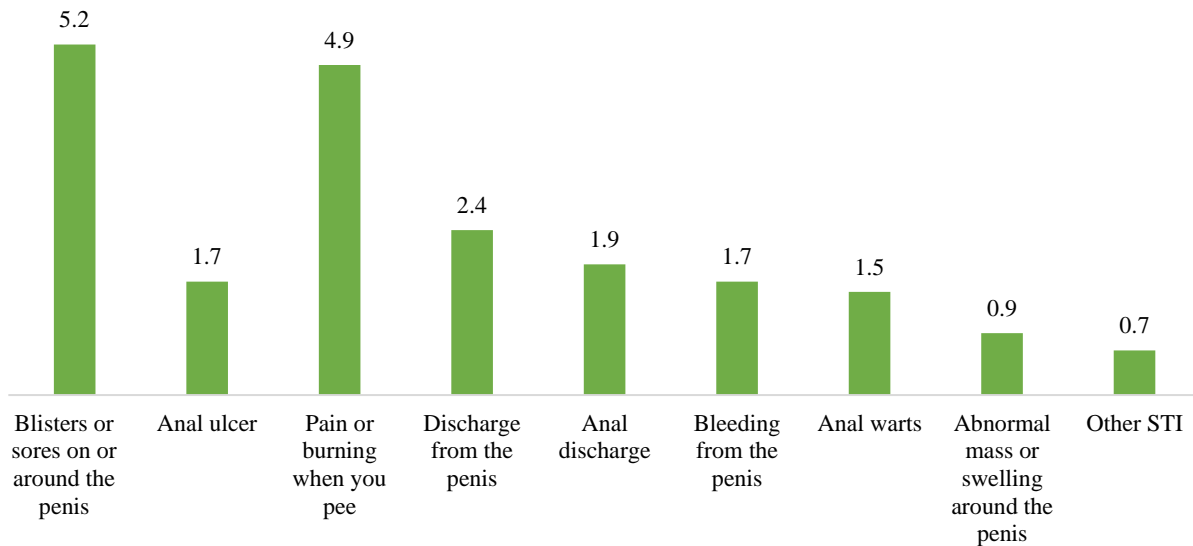
**Figure 30: HIV status discussion with sexual partners among Men who have Sex with Men**



**3.7 Self-reported Sexually Transmitted Infections among Men who have Sex with Men**

Men who have sex with were asked some questions about previous testing for STI. About 33% reported to had ever been tested for STI before the survey while 53.5% of them reported to have never been tested for STIs before the survey.

**Figure 31: Self-reported sexually transmitted infections among MSM**



### 3.8 HIV prevalence among Men who have Sex with Men

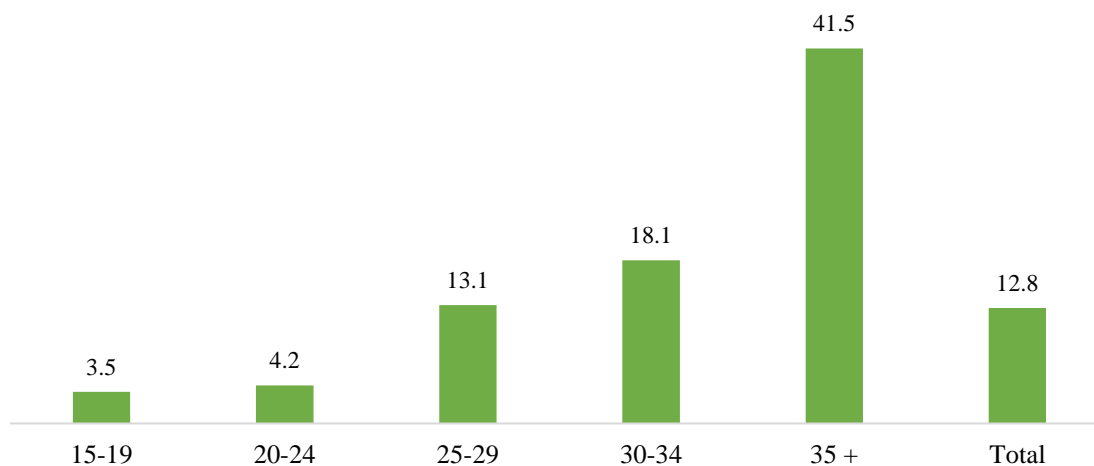
All the 1,956 MSM who participated in the survey were tested for HIV. The HIV prevalence among MSM is 12.8%. Prevalence was found to be high among older MSM aged above 35 years (41.5%) and lowest among those aged 15-19 years (3.5%).

**Table 9: HIV prevalence by age among Men who have Sex with Men**

Age Group	Tested HIV Positive	Tested HIV Positive First Time
<b>15-19</b>	3.5	2.1
<b>20-24</b>	4.2	3.3
<b>25-29</b>	13.1	10.2
<b>30-34</b>	18.1	13.9
<b>35 +</b>	41.5	25.1
<b>Total</b>	<b>12.8</b>	<b>8.4</b>

Just like Female Sex Workers, HIV prevalence for Men who have Sex with Men increases as the ages increase.

**Figure 32: HIV prevalence by age among Men who have Sex with Men**



HIV prevalence among MSM was highest in Mangochi (24.8%) and lowest in Karonga (2.4%).

**Table 10: HIV prevalence by district among Men who have Sex with Men**

District	Tested HIV Positive
Karonga	2.4
Nkhata Bay	8.7
Lilongwe	9.3
Mangochi	24.8
Zomba	9.0
Blantyre	16.1
<b>Total</b>	<b>12.8</b>

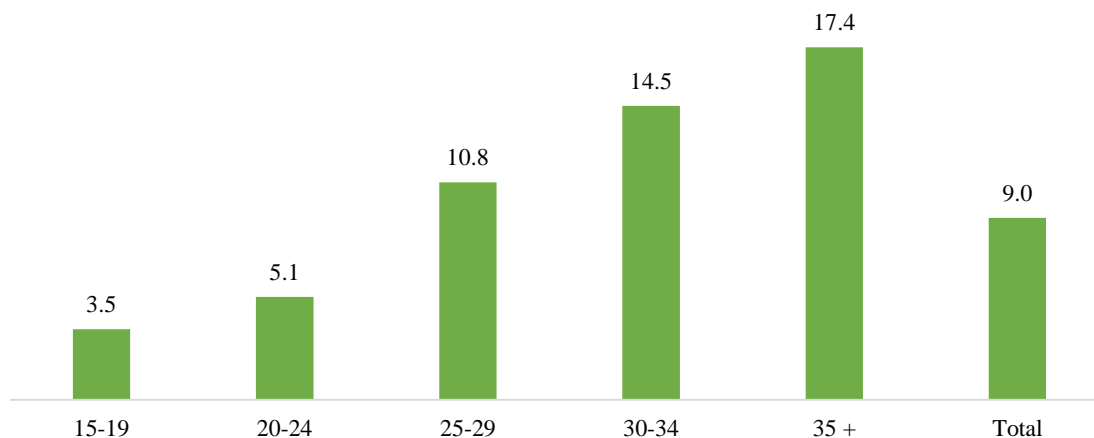
### 3.9 Syphilis prevalence among Men who have Sex with Men

All the MSM were tested for Syphilis and 9% of them tested positive. Syphilis prevalence is higher among the older age group and lowest among the young age group 15-19 years .

**Table 11: Syphilis prevalence by age among Men who have Sex with other Men**

Age Group	Tested Syphilis Positive
15-19	3.5
20-24	5.1
25-29	10.8
30-34	14.5
35 +	17.4
<b>Total</b>	<b>9.0</b>

**Figure 33: Syphilis prevalence by age among Men who have Sex with other Men**



Across districts, Blantyre recorded the highest prevalence of 12.7% while Karonga reported the least prevalence of 3.5%.

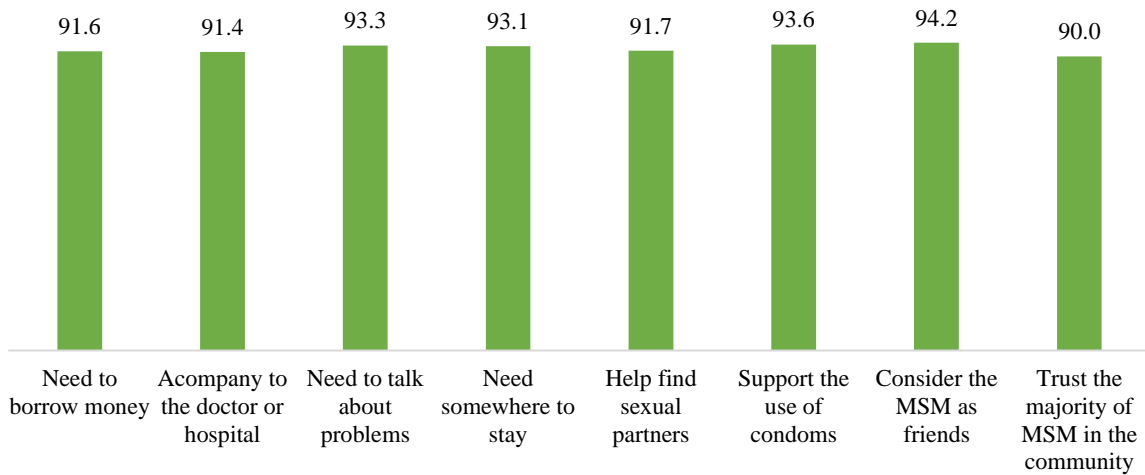
**Table 12: Syphilis prevalence by district among Men who have Sex with Men**

District	Tested Syphilis Positive
<b>Karonga</b>	3.5
<b>Nkhata Bay</b>	4.9
<b>Lilongwe</b>	8.3
<b>Mangochi</b>	11.4
<b>Zomba</b>	7.2
<b>Blantyre</b>	12.7
<b>Total</b>	<b>9.0</b>

### 3.10 Social capital among Men who have Sex with other Men

The results on social capital showed that MSM depend on one another in many social aspects which depicts high levels of trust and confidence. About 91.6% of them reported that they agree that they could count on a fellow MSM when they want to borrow money and 11.4% reported that they strongly agree to depend on fellow MSM to escort them to the hospital.

**Figure 34: Level of trust among Men who have Sex with Men**

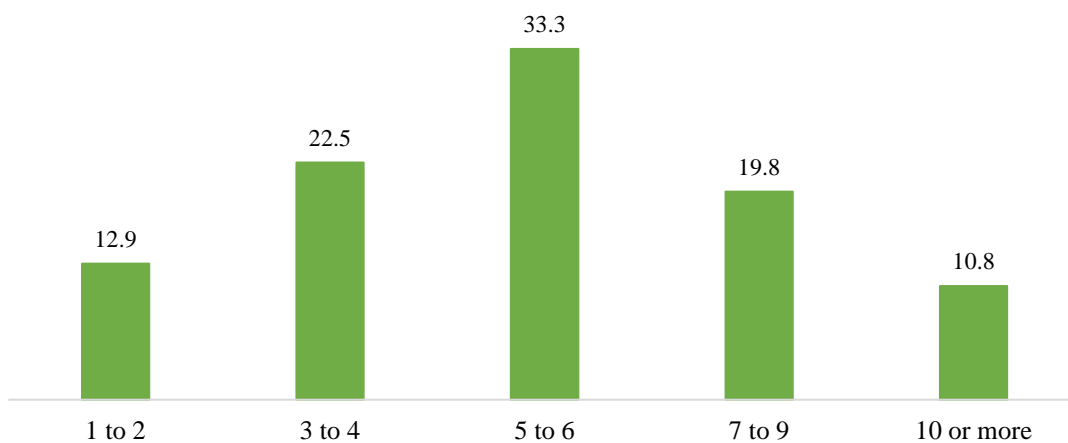


In terms of participation in social gatherings within their communities, more than half of MSM, 58.5% reported taking part in religious activities, 60.2% took part in cultural activities and 56.6% reported to have participated in social clubs. Further, 61.5% reported to have ever participated in HIV prevention activities and 52.5% reported to have participated in meetings that promote MSM issues.

### 3.11 Injecting drug use and alcohol use among Men who have Sex with Men

In the 2020 BBSS, 9.7% of MSM reported to have ever used drugs like heroin and cocaine in the past 3 months. Out of these, 36.3% reported to have shared needles when injecting drugs. On alcohol intake, the majority of MSM (25.7%) reported taking alcohol 2-3 times a week and majority of MSM (33%) reported to have been taking 5-6 standard drinks of alcohol per day.

**Figure 35: Number of standard alcoholic drinks per day among Men who have Sex with Men**



### 3.12 Human rights abuse among Men who have Sex with Men

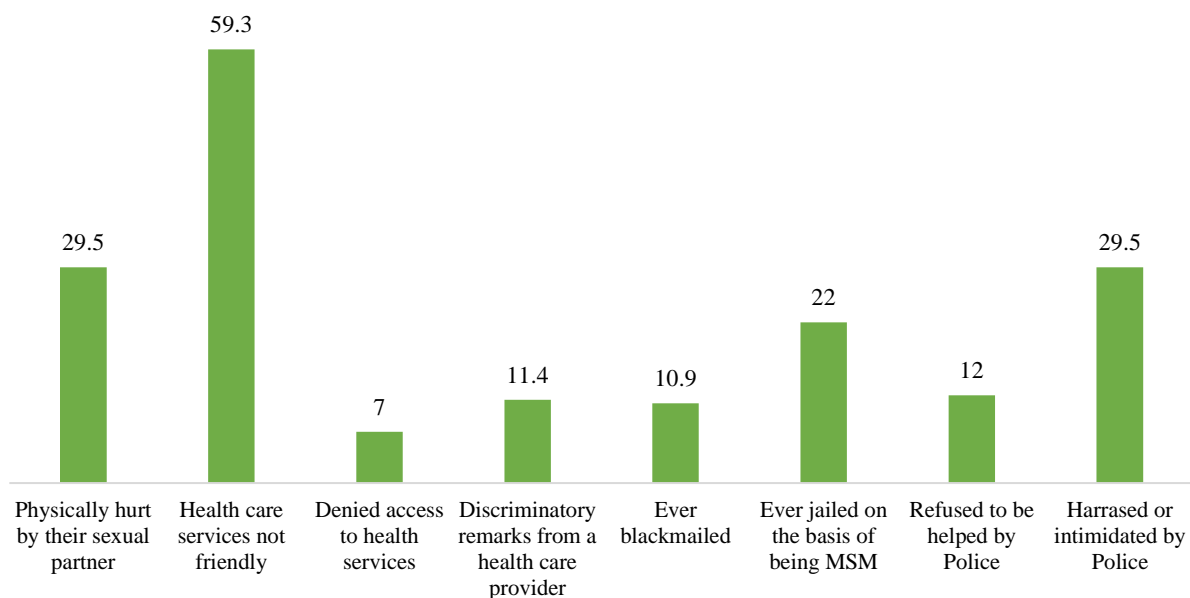
The study found out that the majority of MSM in Malawi have never disclosed their sexual orientation or practice to their family (85.1%), health workers (68.5%) or non MSM friends (78.4%) for fear of being stigmatised.

Among those who disclosed their sexual orientation or practice to their family, 13% reported to have felt excluded from family gatherings and 15% reported to have received discriminatory remarks or heard people gossiping about them.

Among those who disclosed their sexual orientation to their non MSM friends, 15% felt rejected by their non MSM friends.

The 2020 BBSS also found that 59.3% MSM felt that health care services in many local health facilities are not friendly towards the MSM community. Additionally, 12.8% reported to have avoided seeking health services and 7.0% reported being denied access to health services. Furthermore, the study found that 11.4% of MSM reported to have received discriminatory remarks from a health care provider, 7.9% felt that they were not treated fairly at a health center, 17.1% reported to have been verbally harassed and 10.9% reported to have been blackmailed.

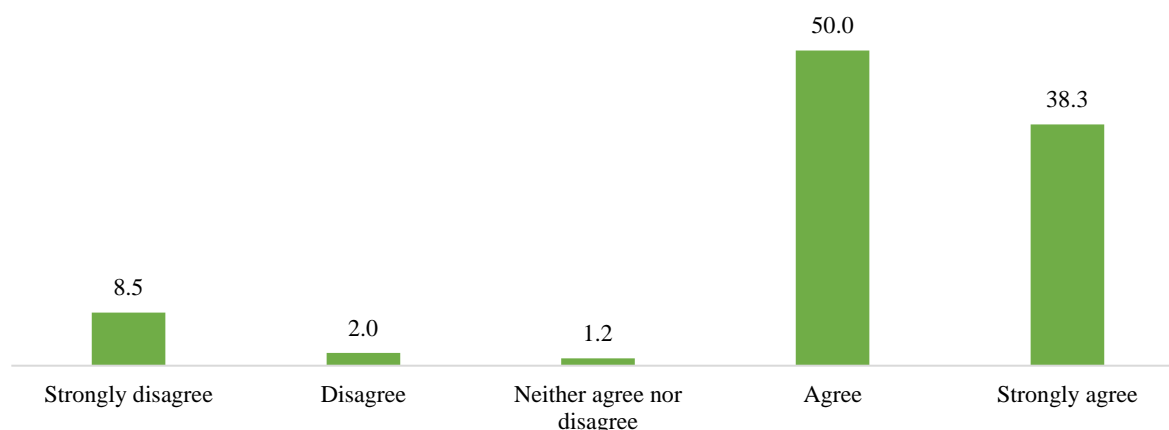
**Figure 36: Human rights and sexual abuse among Men who have Sex with Men**



MSMs were asked their level of agreement if having sex with men is a satisfactory and acceptable way of life for them. Half of them (50.0%) agree that it is satisfactory and acceptable way of life while 8.5% strongly disagree.



**Figure 37: Having sex with men is a satisfactory and acceptable way of life for MSM**



Almost 12% of MSM felt that the police refused to protect them when in danger, 9.8% reported that they were harassed and intimidated by the police and 29.5% reported being physically hurt by their sexual partners. The survey further showed that more than half of the perpetrators of harassment and violence (63.3%) were never arrested. Further, the study shows that 22% of MSM reported being jailed on the basis of being MSM. Of those MSM ever jailed, 58.6% reported having had anal sex with other men while in jail.

### **3.13 COVID-19 pandemic effect among Men who have Sex with Men**

With the emergence of Covid-19 questions related to Covid-19 were added to the MSM questionnaire and 599 MSMs were asked questions to assess their knowledge, exposure and adherence to covid-19 prevention measures. This was also done to assess how the pandemic has affected their daily life. The study found that the majority of Men who have Sex with Men live in rural areas where social distancing was difficult. About 56.8% of FSW reported staying in rural area while 43.2% reported living in district towns and cities. Of them, 74% reported were living in houses without fence where human traffic becomes difficult to control. Sixty three percent of them reported living alone while 19.2% reported living with at least one person.

Two thirds of them (66.9%) reported not to have been able to follow all the Covid-19 preventive measures as recommended by the government. Half (53.6%) reported to have washed their hands or used hand sanitizer at least 5 times the previous day and 89.3% reported to prefer hand washing only as Covid-19 Prevention method while 38.2% preferred using hand sanitizer. A total of 52.6% reported to have not felt flue like symptoms while 47.41% of them reported to have felt flu like symptoms since the first Covid-19 case was identified in the country. Further, 67.6% reported to have either visited bars, restaurants or dancing places and 58.3% reported to have been in a car of more than 10 people in the last 10 days. In addition, 83% reported to have visited the market in the past 7 days and 33.6% of them reported to have had difficulties obtaining food in the past week with (89.1%) due to lack of money.

## 4 Clients of Female Sex Workers

### 4.1 Introduction to Clients of Female Sex Worker Study

The current chapter summarizes results of the Clients of Female Sex Workers (CoFSW) study. It starts with Demographic Characteristics of CoFSW then present results on sexual behaviour. This chapter further highlights on use of condoms and male circumcision.

It also looked at self-reported HIV status and viral load, self-reported STIs and presents HIV and syphilis prevalence.

### 4.2 Demographic Characteristics of Clients of Female Sex Workers

The study involved 2,223 Clients of Female Sex Workers of which 5.2% were aged between 15 and 19 years, 29.6% were aged between 20 and 24 years, 25.1% were aged between 25 and 29 years.

In terms of school attendance 6.6% had never attended school and 46.4% had up to primary school education while 40.98% attended Secondary School and 6.1% attended higher education.

In 2013 BBSS, 44.4% of the clients were married compared to 52% in 2020. Those that reported to have never married were 36.7% in 2020 while in 2013 were 40.1%. About 11.3% reported to have divorced, widowed or separated.

**Table 13: Clients of Female Sex Workers Demographic Characteristics**

Background variable	Clients of Female Sex Workers	
	2013	2020
<b>Age Group</b>		
15 – 19	5.1	5.2
20 - 24	27.2	29.6
25 – 29	27.5	25.1
30 – 34	19.6	15
35+	20.6	25.2
<b>Highest Education Level Attained</b>		
None/Primary	41.8	46.4
Secondary +	58.2	53.6
<b>Religion</b>		
Married	44.4	36.7
Never Married	40.1	52
Divorced/Separated/Widowed	15.5	11.3

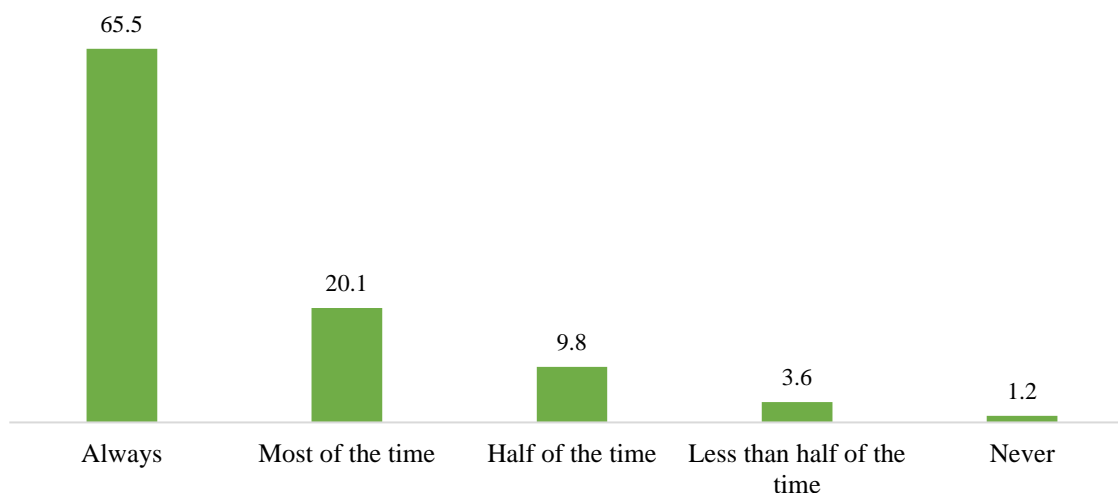
The majority of the CoFSW (98%) were born in Malawi. On earnings, 58.1% were earning about MK 10,000 and only 6.2% were earning between MK 50,000 and MK 75,000 per week with an average earning per week of MK15, 428.39.

### 4.3 Sexual Behaviour among Clients of Female Sex Workers

The 2019-2020 BBSS shows that 61.8% of CoFSW had their first vaginal sex between the ages of 15 and 19 while 16.1% had their first vaginal sex between 10 and 14 years compared with 11% in the 2013 BBSS. The mean age of first vaginal sexual encounter in exchange for money for clients of Female Sex Workers was 17.3. The study further observed that CoFSWs start paying for vaginal sex at a slightly higher age of 20.64. The majority of CoFSW (89.2%) reported to have had sex with a Female Sex Worker in the past 3 months.

The findings further indicate that, for those that have ever engaged in anal sex with FSW the mean age at first anal sex in exchange for money was 20 years. Only 10.7% of the CoFSWs have ever had anal sex and of them 65.1% reported to have had anal sex in the past month. Most CoFSWs reported having anal sex one to two times in the past month (21.9% and 14.8%, respectively) while 7.1% reported to have had anal sex more than 8 times.

**Figure 38: Frequency of paying for sex with a Female Sex Worker in the past 3 months**



In terms of frequency of paid sex, two thirds of CoFSWs (65.5%) had always paid for sex with FSW in the past 3 months and 20.6% reported to have paid for sex most of the times in the past 3 months prior to the study. The findings also indicated that 37.3% had sex with a regular FSW in the past 30 days. Approximately 81.3% of CoFSWs had sex with their regular sexual partners in the past 30 days and 75% had sex with a new Female Sex Worker in the past 30 days prior to the survey.

The mean amount of money paid to women for vaginal sex is MK 1,500 with the highest payment being MK 45,000. There was no difference on the average amount paid for anal and vaginal sex with a Female Sex Worker.

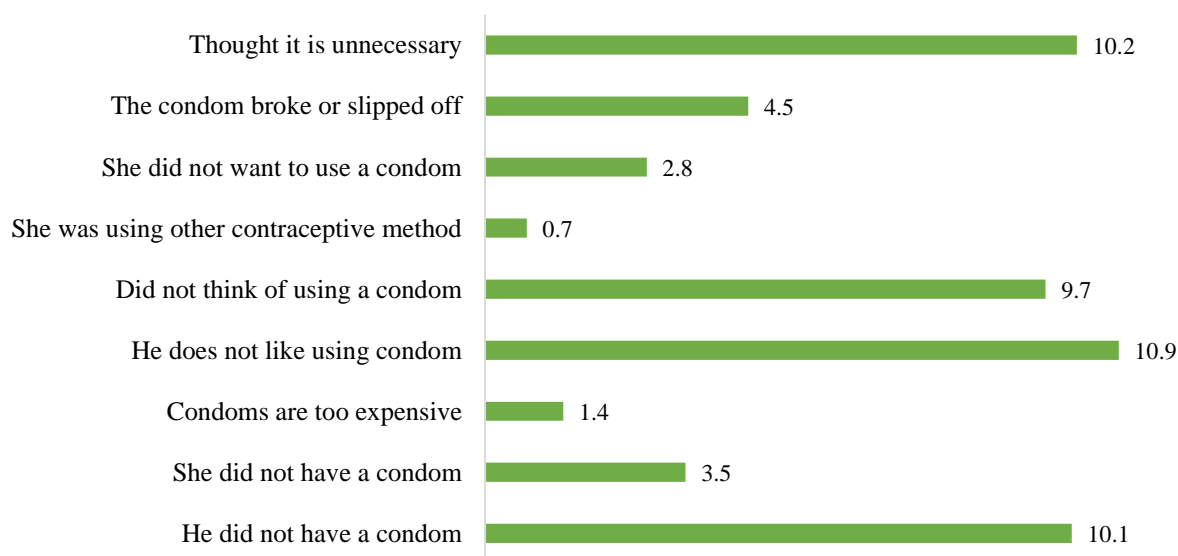
#### 4.4 Condom use with Female Sex Workers

Condom use is one way of preventing the spread of HIV and STIs in a population. Among other topics, the 2020 BBSS captured information on frequency of condom use among clients of Female Sex Workers. The study indicated that only 35.4% CoFSWs reported always using condoms during vaginal sex while 14.8% of those ever-had anal sex reported always using condoms during anal sex. The findings of the study further indicated that 66.6% of the clients reported to have used a condom the first time they had vaginal sex with a new Female Sex Worker and 33.4% reported no condom use. As for anal sex, 40.2% reported to have used condoms during the first time they had anal sex with a new Female Sex Worker while 59.8% did not use a condom.

Approximately two thirds of the CoFSWs (68.9%) reported to have used a condom the last time they had paid vaginal sex compared with 39.9 percent of CoFSWs who used a condom the last time they had paid anal sex with a woman. The study showed that 25.3% of CoFSWs used the condoms twice during the entire duration of vaginal sex act while 24.5% of clients to Female Sex Workers had used condoms once during the entire duration of vaginal sex act.

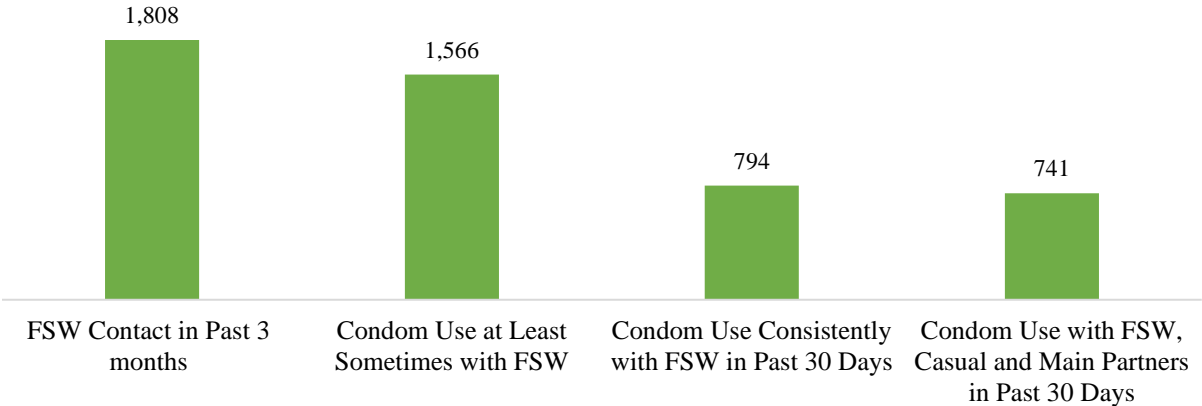
Several reasons were mentioned by the majority of clients of Female Sex Workers for not using condoms. Some of them 10.9% reported that they did not like using condoms while 10.2% thought it to be unnecessary, 9.7% didn't think of using a condom and 7.2% of them reported not to have a condom during the time of sex.

**Figure 39: Reason for not using condom in the last sex with a Female Sex Worker**



Out of 2,223 Clients of FSW, 1,802 were HIV negative and reported contact with an FSW in the past 3 months. Of these, 1,566 reported using a condom at least sometimes with an FSW in the past 3 months for either vaginal or anal sex. Of these, 794 reported always using condoms with FSW in the past 30 days. Of these, 741 reported using a condom with all partners in the past 30 days, including FSW, casual, and main partners.

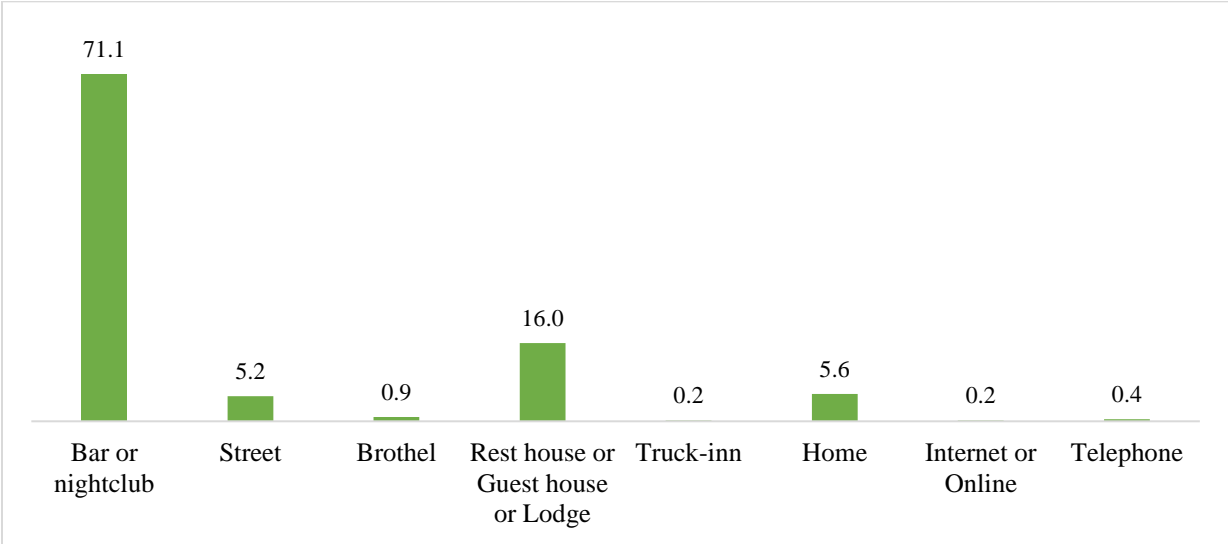
**Table 14: HIV Condom Cascade for HIV-Negative Clients of Female Sex Workers**



**4.5 Place of Meeting where CoFSW meet with FSW**

The 2020 BBSS show that 71.1% of CoFSWs meet with FSW in bars or nightclubs, 16.0% in rest houses, guest houses or lodges.

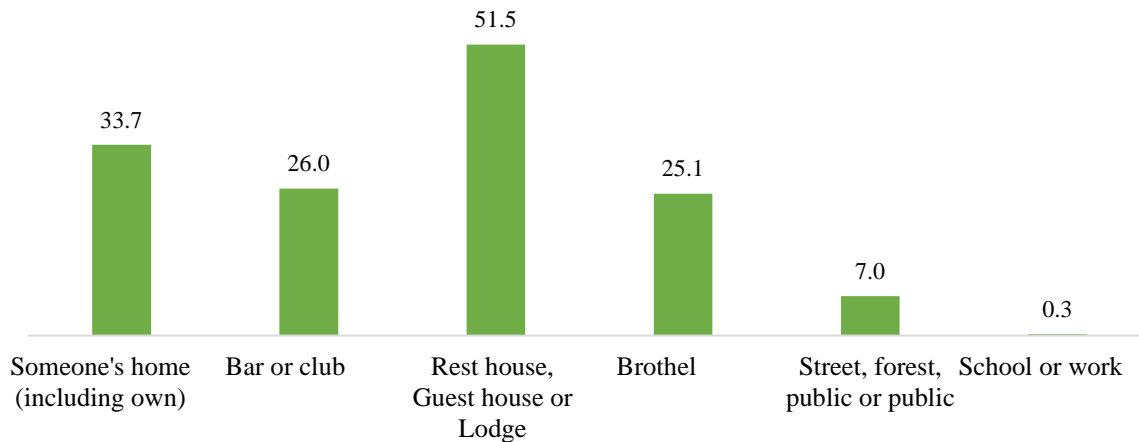
**Figure 4.1: Places where CoFSW meet with FSW**



#### 4.6 Places where CoFSW have sex with FSW

In terms of places where CoFSW have sex with Female Sex Workers, a higher percentage reported to have been having sex in rest houses, guest houses or lodges and someone's home (including own home) 51.5% and 33.7% respectively. A smaller percentage (0.3%) reported to have been having sex in schools and workplaces.

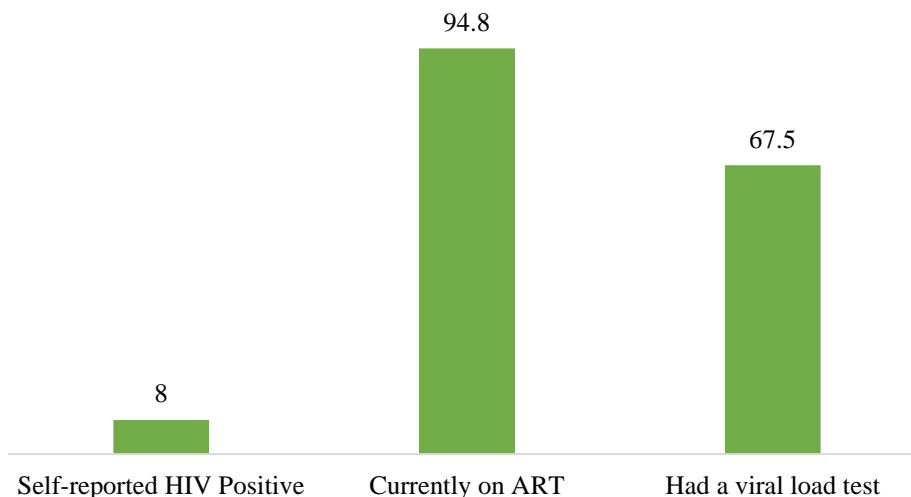
**Figure 40: Places where CoFSW have sex with FSW**



#### 4.7 Self-reported HIV status and viral load among Clients of Female Sex Workers

On self-reported HIV status, 78.6% of CoFSW reported that they have ever tested for HIV. The study further observed that on self-reported HIV positive status, 8% reported that they have ever been told that they have HIV by a health care provider. When asked about ART intake, 94.8% reported being on ARVs and 67.5% reported having their viral load tested.

**Figure 41: CoFSW Self-reported HIV Status, Currently on ART and had a Viral Load Test**



The study also found that disclosure of HIV status is low among Clients of Female Sex Workers as only 29.9% reported to have talked about their HIV status the last time they had sex with a new Female Sex Worker.

#### 4.8 Male circumcision among Clients of Female Sex Workers

Clients of Female Sex Workers were asked about circumcision as one way of HIV prevention estimated at 9.4% in the country. The study showed that about half (45.9%) of the clients to Female Sex Workers were circumcised whilst 54.1% have never been circumcised prior to the survey. The results further showed that 50.2% who have been circumcised have undergone medical male circumcision while 49.89% percent have been circumcised in a traditional way.

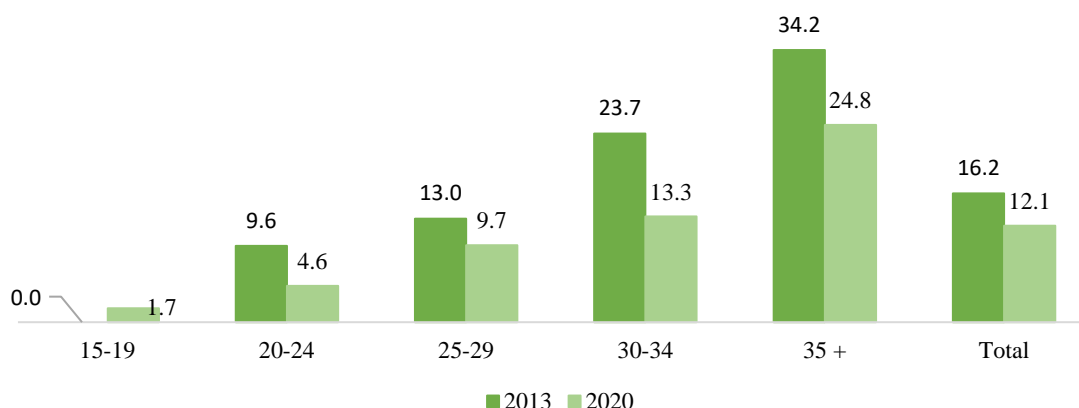
#### 4.9 HIV prevalence among Clients of Female Sex Workers

The HIV test was conducted for all CoFSW who participated in the study just like in 2013 BBSS. The results showed that HIV prevalence among clients had declined over the years from 16.2% in 2013 BBSS to 12.11 in 2020. At national level, the study indicated that prevalence increases with increasing age.

**Table 15: HIV prevalence by age among CoFSW**

Age Group	Tested HIV Positive	Tested HIV Positive New Infections
15-19	1.7	2.8
20-24	4.6	2.5
25-29	9.7	7.3
30-34	13.3	7.6
35 +	24.8	14.3
<b>Total</b>	<b>12.1</b>	<b>7.3</b>

**Figure 42: HIV prevalence by age in 2013 and 2020 BBSS among Clients of Female Sex Workers**



At district level, the study observed that Mchinji district had the highest prevalence (18.1%) followed by Zomba district (17%), while Mangochi district had the lowest prevalence (7.4%).

**Table 16: HIV prevalence by district among Clients of Female Sex Workers**

District	Tested HIV Positive
Karonga	15
Lilongwe	7.9
Mangochi	7.4
Mchinji	18.1
Nkhata Bay	9.6
Zomba	17.4
<b>Total</b>	<b>12.1</b>

#### 4.9.1 Syphilis prevalence among clients of Female Sex Workers

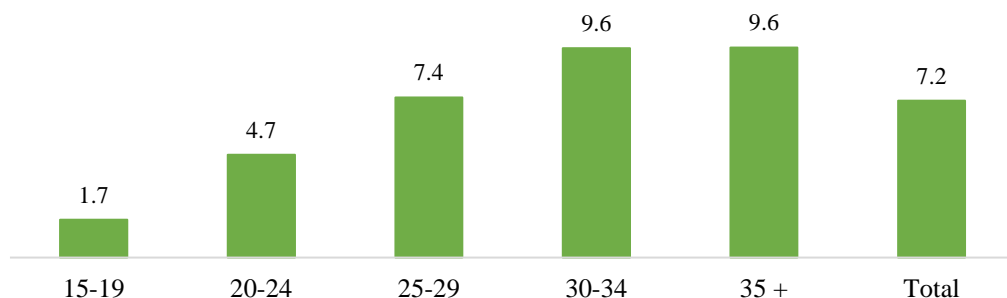
All clients of Female Sex Workers were tested for syphilis and about 7.2% of them tested positive for syphilis in the 2020 BBSS as compared to 4.2% in 2013 BBSS.

**Table 17: Syphilis prevalence by age among Clients of Female Sex Workers**

Age Group	Tested Syphilis Positive
15-19	1.7
20-24	4.7
25-29	7.4
30-34	9.6
35 +	9.6
<b>Total</b>	<b>7.2</b>

Syphilis prevalence is lower in young Clients of Female Sex Worker and increases as the ages increase.

**Figure 43: Syphilis prevalence by age among CoFSW**





At district level, the findings showed that higher and lower percentages of syphilis prevalence were obtained in Nchinji and Nkhata Bay districts, 13% and 2.3% respectively.

**Table 18: Syphilis prevalence by district among Clients of Female Sex Workers**

Area	Tested Syphilis Positive
<b>Karonga</b>	5.4
<b>Nkhata Bay</b>	2.3
<b>Lilongwe</b>	6.8
<b>Mchinji</b>	13
<b>Mangochi</b>	6.1
<b>Zomba</b>	10
<b>Total</b>	<b>7.2</b>

#### **4.10 Injecting drug use among Client of Female Sex Workers**

On drug use, 1.2% of clients of Female Sex Workers reported to have ever injected unprescribed drugs and out of these, 48.5% reported to have injected drugs between 4-6 times over the past 3 months prior to the survey. Of the 1.2% clients that had ever injected unprescribed drugs, 37% reported to have shared syringes with someone and out of these 26.9% reported to have shared the used syringes with Female Sex Workers.

## 5 Extrapolated size estimates for Female Sex Workers and Men who have Sex with Men in Malawi

### 5.1 Extrapolation methods

Extrapolation methods were used to compute size estimates for districts where the Malawi BBSS survey was not implemented. Multiple imputation approach was used to impute counts and proportions of Female Sex Workers (FSW) and Men who have Sex with Men (MSM) for each district. Multiple imputation is a modern statistical method used to account for missing data; in the case of population size estimates, the “missing” data are size estimates in areas where direct size estimates are not available. Multiple imputation is an appropriate method for extrapolating size estimates to be produced for localities outside the study implementation area, based on contextual variables measured across all localities of interest. Briefly, the multiple imputation approach involves fitting a model of the relationship between key population size and contextual variables, then applying multiply drawn regression coefficients and locality-specific values for the contextual variables to produce size estimates for localities outside the study area. The process of iteratively drawing regression coefficients allows for uncertainty in the parameter estimates to propagate through to final confidence intervals around the imputed size estimates. Multiple imputation has been used to extrapolate direct size estimates in other settings, including Uganda<sup>1</sup> and the Dominican Republic<sup>2</sup>.

The Malawi BBSS provided direct size estimates of the FSW population in 8 districts and direct size estimates of the MSM populations in 6 districts.

For each district, we first modeled the number of key population (FSW or MSM) members as a function of district characteristics. In modeling FSW population size, the model included the male to female ratio; high HIV prevalence among women, based on the proportion of women on ART relative to other districts; and presence of mines, tea estates, or military barracks. In modeling MSM population size, the model included high HIV prevalence among men, based on the proportion of men on ART relative to other districts; presence of mines, tea estates, or military barracks; and presence of an international border crossing. For each key population, after fitting the model in districts with size estimates, we drew 100 sets of regression coefficients based on the observed relationships between district characteristics and available size estimates. For each of the 100 imputations, the drawn set of regression coefficients and known characteristics of the district were used to produce a predicted count of key population members (FSWs or MSM) for every district without a direct size estimate. Results were summarized across imputations to produce rounded estimates of the number of FSW and MSM and

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<sup>1</sup> Edwards JK, Mulholland G, Weir S. Consultant Report: Size Estimation of Key Populations in Uganda. Prepared for Makerere University School of Public Health. 2018.

<sup>2</sup> Edwards JK, Hileman S, Donastorg Y, et al. Estimating Sizes of Key Populations at the National Level: Considerations for Study Design and Analysis. *Epidemiology*. 2018;29(6):795-803. doi:10.1097/EDE.0000000000000906

associated confidence intervals nationally, by region, and by district. Analyses were performed in SAS 9.4 (Cary, North Carolina, US). Technical details concerning the imputation process are provided in the Appendix.

## 5.2 Population Size Estimates Results

### 5.2.1 Female Sex Workers Size Estimates

Through the described extrapolation methods, we estimated that 36,100 women would be classified as FSWs according to the definition used in the BBSS. This corresponds to 0.8% of Malawi’s female population age 15 to 49 years.

The percentages are based on the female population age 15 to 49. Estimates are based on direct size estimates computed in the Malawi BBSS and on imputed estimates in other districts of Malawi, informed by available direct size estimates and contextual variables.

Regional estimates shown in table below suggested that the Central region had the highest number of FSWs (16,200), followed by the Southern region (14,200), and then the North (5,700). Estimates of the prevalence of sex work among women are also shown. Accounting for population size, we estimated that a higher proportion of women age 15 to 49 engage in sex work in the Northern region (1.0%), as compared to the Central region (0.9%) and the South (0.7%).

**Table 19: Regional estimates of the number and percent of women engaged in sex work**

Region	Number of women ages 15 to 49	Estimated percent of women engaged in sex work	Rounded estimate of the number of Female Sex Workers
North	568,900	1.0	5,700
Central	1,868,254	0.9	16,200
South	1,912,675	0.7	14,300

The table below shows district-level estimates of the number and percent of women who are sex workers. The table includes the extrapolated as well as the eight direct estimates from the Malawi BBSS for Karonga, Nkhata Bay, Mchinji, Lilongwe, Mangochi, Mwanza, Blantyre City, and Zomba. Lilongwe (rural and city), Mzimba, and Kasungu had the highest estimated numbers of FSWs, each with rounded estimates of at least 2,000. The estimated percentage of women engaged in sex work was highest (i.e., exceeding 1.0%) in Karonga, Nkhata Bay, Likoma and Mwanza.

The names of districts where the size estimates were computed in the Malawi BBSS are indicated with an asterisk (\*). Extrapolated estimates are provided for other districts and were informed by the available direct size estimates and contextual variables.

**Table 20: District estimates of the number and percent of women engaged in sex work**

Locality	Number of women ages 15 to 49	Estimated percent of women engaged in sex work	Rounded estimate of the number of Female Sex Workers
<b>Chitipa</b>	57,391	1.0	500
<b>Karonga*</b>	91,703	1.3	1,200
<b>Nkhata Bay*</b>	68,375	1.1	700
<b>Rumphi</b>	55,648	1.0	500
<b>Mzimba</b>	226,936	0.9	2,100
<b>Likoma</b>	3,889	1.1	< 100
<b>Mzuzu City</b>	64,958	0.8	500
<b>Kasungu</b>	202,935	1.0	2,100
<b>Nkhotakota</b>	95,154	1.0	900
<b>Ntchisi</b>	75,828	1.0	700
<b>Dowa</b>	190,031	1.0	1,900
<b>Salima</b>	113,990	0.9	1,100
<b>Lilongwe Rural</b>	398,838	0.8	3,000
<b>Mchinji*</b>	144,570	0.5	800
<b>Dedza</b>	203,380	0.9	1,900
<b>Ntcheu</b>	158,868	1.0	1,500
<b>Lilongwe City*</b>	284,660	0.8	2,400
<b>Mangochi*</b>	269,300	0.7	1,900
<b>Machinga</b>	168,598	0.9	1,500
<b>Chiradzulu</b>	89,533	0.7	600
<b>Blantyre Rural</b>	114,567	0.7	900
<b>Mwanza*</b>	32,643	1.9	600
<b>Thyolo</b>	182,649	0.7	1,300
<b>Mulanje</b>	169,169	0.7	1,200
<b>Phalombe</b>	99,964	0.7	700
<b>Chikwawa</b>	135,257	0.7	1,000
<b>Nsanje</b>	70,237	0.7	500
<b>Balaka</b>	104,793	0.7	700
<b>Neno</b>	33,436	0.7	200
<b>Blantyre City*</b>	230,946	0.8	1,800
<b>Zomba*</b>	211,583	0.6	1,200

## 5.2.2 Men who have Sex with Men Size Estimates

After applying extrapolation methods, our results estimate that there are 23,200 MSM in Malawi. This number is approximately 0.6% of the number of men in Malawi age 15 to 49 years.

Regional estimates are given in table below. We estimated the highest numbers of MSM were in the Central region (10,500) and Southern region (10,500), with the North having far fewer MSM (2,200). When the size estimates were taken as a percentage of men ages 15 to 49, the highest percent was in the Central and Southern regions (0.6%), followed by the North (0.4%).

**Table 21: Regional estimates of the number and percent of Men who have Sex with Men**

Region	Number of men ages 15 to 49	Estimated percent of Men who have Sex with Men	Rounded estimate of the number of Men who have Sex with Men
<b>North</b>	533,001	0.4	2,200
<b>Central</b>	1,801,542	0.6	10,500
<b>South</b>	1,735,465	0.6	10,500

Table below shows estimates of the number of MSM in each district. The percentage of men in each district who are MSM is also shown; this was computed using the number of men age 15-49 in the district as the denominator. Estimates for Karonga, Nkhata Bay, Lilongwe, Mangochi, Blantyre, and Zomba are direct estimates from the Malawi BBSS. Lilongwe and Blantyre had the highest estimated numbers of MSM, each with rounded estimates in excess of 2,000. The estimated percentage of men who are MSM was highest, at 0.9%, in Nkhata Bay, Nkhotakota, and Salima.

The names of districts where the size estimates were computed in the Malawi BBSS are indicated with an asterisk (\*). Extrapolated estimates are provided for other districts and were informed by the available direct size estimates and contextual variables.

**Table 22: District estimates of the number and percent of Men who have Sex with Men**

Locality	Number of men ages 15 to 49	Estimated percent of Men who have Sex with Men	Rounded estimate of the number of Men who have Sex with Men
<b>Chitipa</b>	53,400	0.1	100
<b>Karonga*</b>	84,864	0.3	300
<b>Nkhata Bay*</b>	65,639	0.9	600
<b>Rumphi</b>	53,688	0.3	200
<b>Mzimba</b>	208,068	0.3	500
<b>Likoma</b>	4,193	0.3	< 100
<b>Mzuzu City</b>	63,149	0.8	500
<b>Kasungu</b>	200,078	0.4	900
<b>Nkhotakota</b>	90,428	0.9	900
<b>Ntchisi</b>	72,947	0.4	300
<b>Dowa</b>	184,627	0.4	800
<b>Salima</b>	104,952	0.9	1,000
<b>Mchinji</b>	141,585	0.1	200
<b>Dedza</b>	184,010	0.3	600
<b>Ntcheu</b>	149,419	0.3	400
<b>Lilongwe*</b>	673,496	0.8	5,500
<b>Mangochi*</b>	228,169	0.6	1,300
<b>Machinga</b>	146,422	0.4	600
<b>Chiradzulu</b>	80,719	0.8	600
<b>Mwanza</b>	31,012	0.1	< 100
<b>Thyolo</b>	156,947	0.8	1,200
<b>Mulanje</b>	150,101	0.3	400
<b>Phalombe</b>	92,720	0.3	200
<b>Chikwawa</b>	130,298	0.8	1,000
<b>Nsanje</b>	63,533	0.3	200
<b>Balaka</b>	91,846	0.8	700
<b>Neno</b>	31,183	0.8	200
<b>Zomba*</b>	190,334	0.8	1,600
<b>Blantyre*</b>	342,181	0.7	2,300

### **5.3 Discussion: Extrapolated size estimates**

These results indicate variation in the number of FSW and MSM across districts within Malawi. They particularly highlight differences in the number of FSW and MSM in the Northern region as compared to the Central and Southern regions. The North had the lowest estimated number of FSW and MSM. Estimates of the percentage of men and women in each population consider underlying variations in population size, however, and should also be taken into account. The North had the highest estimated prevalence of sex work among women, though the estimated number of FSWs was lower than in other regions. For MSM, the numbers and percentages followed a more consistent pattern, as results suggest the North had both the smallest percentage and smallest number of MSM as compared to the other regions. Rounded district estimates of the number of FSWs ranged from fewer than 100 to 5,500. The regional and district variation in estimates supports the importance of geographically tailoring allocation of programs and resources intended for FSW and MSM.

The extrapolated estimates were generated through an approach that allowed us to account for uncertainty in the imputations to produce accurate standard errors. Estimated numbers of key population members were rounded to the nearest hundred, however, to remove the impression of inflated precision due to potential unquantified error in the direct estimates. The multiple imputation approach relies the accuracy of the model describing the relationship between the size estimate and contextual variables and accuracy of the direct size estimates provided for the 8 districts (for FSWs) or 6 districts (for MSM) in the BBSS. Any limitations related to the accuracy of the direct estimates would carry through to the extrapolated estimates. District estimates also do not account for potential recent shifts in the residence due to COVID-19. Migration out of denser urban areas, for example, could reduce the number of key population members found in cities and increase the number in rural areas.

## **6 Appendices**

### **6.1 Appendix 1: Study Methodology**

#### **6.1.1 Mapping of Target Groups**

Prior to data collection, an initial mapping of venues was done to develop the sampling frame for the clients of sex workers and provide formative data for Female Sex Workers and Men who have Sex with Men studies. The mapping activity involved consultative meetings with other organisations (i.e. CEDEP, FPAM, FSWA, Pakachere), forums, and networks working with different targeted groups. Teams moved throughout the 7 study districts (except Blantyre) and identified the sites where members of the target population could be found. Through the mapping exercise, the estimated size of the clients of sex worker population at each site was established. In addition, the mapping exercise helped to find out about a limited number of variables that would help with data collection (for example, languages spoken by the target group at each site, times of day that the target group can be found at the sites and any dangerous limitations at the sites).

To ensure quality data during the mapping exercise, there was strict supervision so that the whole district is fully mapped.

Apart from the above information, the mapping field teams produced sketch maps describing the location of the sites in relation to notable landmarks. This assisted enumerators during the main survey to easily locate the sites of the selected populations.

#### **6.1.2 Training of Trainers**

Senior supervisors and members of the TWG who were responsible for training field workers had a 5-days training of trainers before the enumerators training. The training was initiated by CDC Malawi and facilitated by a specialist from CDC Atlanta. The training mainly focused on how to conduct a respondent driven sampling and time location sampling for key populations. The training covered the following areas:

- Definition of key populations
- HIV surveillance among key populations
- key components of respondent-driven sampling
- RDS survey site, Coupon verification, eligibility screening, informed consent, interview, pre and post-test counselling, Specimen collection and testing, peer recruitment training and provision of treatment, active linkage to services and monitoring recruitment
- Perform recruitment diagnostics and interpret results, assess population homophily and recruitment homophily
- Use of respondent driven sampling coupon management system in enrolling, managing participant compensations and peer recruitment and coupon design



- Population size estimation (PSE) methods

### **6.1.3 Recruitment and Training of Enumerators and Field Supervisors**

The study recruited enumerators with a minimum of a Malawi School Certificate of Education qualification able to communicate in English, Chichewa and Tumbuka as optional. These were well experienced enumerators and those who performed well during the training test and field practicals were selected. Teams of 5 enumerators each and one supervisor were formed. Two enumerators were responsible for blood collection and pre and post-test counselling to all participants to know their HIV status and the other three enumerators conducted the interviews. Besides monitoring interviews, field supervisors were trained on how to use the RDS coupon management system for enrolling participants, managing transport refunds and participation and peer recruitment allowances. The enumerators were trained using training materials developed based on WHO Biobehavioral Survey Guidelines for populations at risk of HIV. The training was facilitated by the National Statistics Office, with technical assistance from MOH and NAC. The two week-long training which focused on values clarification, questionnaire administration, interviewing techniques, specimen collection and storage, and later 3 days refresher training just before commencing data collection training consisted of classroom lectures, mock interviews and practice interviews in the field.

The following themes were addressed during the training:

- Goals and objectives of the 2019 -20 Malawi BBSS;
- Study methodology (including Respondent Driven Sampling);
- Study site identification;
- Techniques of using RDS for recruiting FSW and MSMs;
- Techniques of using TLS for recruiting clients of Female Sex Workers;
- Interviewing techniques and filling out questionnaires;
- Specimen collection and storage;
- Ethical considerations including informed consent procedures
- Basic HIV and AIDS and STI education;
- HIV testing and counselling including HIV and syphilis rapid testing
- DBS storage and transportation to HIV reference laboratory

The team also underwent another refresher training for 2 days after the covid-19 break which incorporated covid-19 preventive measures and guidelines and also discussed an additional section on covid-19 which was added to the questionnaire. Field supervisors were trained together with the enumerators, as they were responsible for maintaining high quality data by closely supervising the enumerators and testers. During data collection, the field supervisors were responsible for implementation of RDS methodology, proper administration of the questionnaire and completion of the questionnaires. In addition, the field supervisors were responsible for coupon management process using the RDSCM system, team organization, supervision, monitoring and problem solving in the field. It was the field supervisor's

responsibility to synchronize completed questionnaires from enumerators each day and send to a server at National Statistical Office via the internet.

#### **6.1.4 Survey Data Collection Tools**

Pre-coded questionnaires adapted from previous BBSSs were used in this study to ensure that previously collected variables are collected for trend analysis and emerging issues are also captured. The questionnaires were adapted in such a way that the collected variables should contribute towards national and international data requirement in accordance with the WHO Biobehavioral Survey Guidelines for populations at risk for HIV. The instruments covered the following key areas:

- Socio-demographic characteristics of the respondent including personal network;
- Sexual behaviour including anal and oral sex;
- Knowledge and use of condoms;
- Knowledge about STIs and STI treatment-seeking behaviour;
- Knowledge, attitudes and opinions about HIV and AIDS;
- Social protection;
- HIV, syphilis; and
- Exposure to interventions.

#### **6.1.5 Data Collection Procedures**

The 2019-2020 Biological Behavioural Surveillance Survey used Computer Assisted Personal Interview (CAPI) technology for data collection unlike the previous BBSS which used several paper questionnaires, mapping and screening forms. One of the advantages of CAPI technology is that consistency checks are done whilst in the field and potential errors are flagged out. Field personnel for BBSS collected data in a face-to-face meeting with the respondent using a mobile device and collected data was sent to a server at NSO in Zomba in real time via internet connection.

To evaluate accuracy and efficiency of the CAPI application several tests and a pretest of BBSS was conducted where lessons learnt and suggestions from the iterative process were incorporated to finalize the application.

The survey was administered for all target groups through one-on-one and face-to-face interviews in private settings that guaranteed the confidentiality of information provided by the respondent. The survey team for each group consisted of three interviewers, one supervisor and two HTS providers. The respondents were assured that all information and discussions remained confidential, that no personal identifiers would be recorded, and that their participation was voluntary. They were informed that they may refuse to answer any questions and that they may opt out of the study at any time. They were also told that their decision to participate or to not to participate did not affect any benefit that they would normally receive. All study related

biological specimens and questionnaires were labelled with study numbers and barcodes. The respondent's identity was not asked nor entered onto the survey application or any form. Signed consent was obtained for each respondent prior to conducting the interview. Interviewers ensured that respondents were not interviewed twice by asking respondents if they were interviewed earlier on in the survey and using the screening forms.

Teams identified sites and established RDS interview sites for conducting interviews. A respondent driven sampling coupon management (RDSMC) system was used to enrol participants and manage their transport refunds participation and peer recruitment allowances.

### **6.1.6 Biomarker Study**

The study included HIV testing and syphilis testing. This section presents the rationale, methodology, and other considerations in the conduct of the biomarker aspect of the study.

#### **6.1.6.1 Rationale for Including HIV and syphilis Testing in the BBSS**

Adult prevalence or percentage of adults aged 15–49 infected with HIV or syphilis infection is a commonly used measure of the extent of HIV or Syphilis in a population.

The Malawi Demographic and Health Survey (MDHS) provides HIV estimates for the nation, however, HIV prevalence among high-risk and vulnerable populations cannot be ascertained from the data as the sample sizes are not large enough. The Biological and Behavioural Surveillance Survey (BBSS) is a monitoring and evaluation tool designed to track trends in HIV/AIDS-related knowledge, attitudes and behaviours in subpopulations at particular risk of infection. BBSS findings serve many purposes; they yield evidence of the impact of an HIV program; provide indicators of HIV program successes and highlight persistent problem areas; identify priority populations; identify specific behaviours in need of change; function as a policy and advocacy tool; and supply comparative data concerning risk behaviours.

### **6.1.7 Study Population**

The process of organizing the biomarker study was achieved through a highly collaborative process overseen by the BBSS Technical Working Group (TWG). The TWG agreed that Female Sex Workers, Men who have Sex with Men and Clients of Female Sex Workers should be included in the study. It was suggested that the same sample size for the survey be used for the biomarker study.

### **6.1.8 Social Mobilization**

Social mobilisation increases awareness in the target population and hence increases the response rate. It also potentially dispels misconceptions and myths regarding procedures that are used during the study (e.g. blood collection). The social mobilization team conducted sensitization meetings with the district management team and also sensitized the key populations during their social gatherings. Social mobilization was conducted as part of the mapping exercise during

which NSO supervisors and other members of the study team conducted meetings with District Commissioners, Police Officer In-charges, Directors of Health and Social Services, local community organisations, NGOs and other relevant networks who work with the key population groups, peer educators, key informants and gatekeepers to inform them of the purpose of the study. Since the survey included a biomarker component (collection of blood samples), social mobilization included sensitizing the community and target population on the purpose and procedures for blood collection and anonymity of results.

### **6.1.9 Specimen Collection**

#### **6.1.9.1 HIV and Syphilis Testing**

All the teams comprised two trained HIV Testing Services' providers who were approved by the Ministry of Health through Department of HIV and AIDS. Their role was to collect blood samples through finger prick, conduct Dried Blood Spot (DBS) preparation and HIV rapid testing. Additionally, all providers recruited in the survey underwent a one-week refresher training on blood collection procedure through finger prick, DBS preparation, HIV/ Syphilis testing and safety at an HTS workplace. Each team was supplied with the required reagents and supplies for specimen collection, testing and safe handling of waste. The supplies included Determine and Unigold HIV test kits, SD Bioline Syphilis 3.0 test kit, 70% alcohol, 3.5% Jik, Cotton wool roll, Blood lancets, Capillary tubes, Autoclavable bin liners, Sharp Boxes, permanent markers, aprons, timers, DBS drying rack, ziplock bags and bench mats.

Following a finger prick, blood was collected first onto a filter paper known as DBS card, filling all 5 circles and left to dry on a DBS rack. Thereafter, 2 more blood drops were collected from the same prick for the initial HIV and Syphilis testing. In event that the initial HIV test came out reactive, participants were asked for a second finger prick for the second HIV test.

#### **6.1.9.2 DBS Preparation, Transportation and Storage**

The DBS cards were labelled with the study participant ID, pre-printed barcode and date of collection. After an overnight drying of blood on the card, DBS were packaged in ziplock bags with 3-5 desiccants inserted inside and stored in a safe dry place. The desiccants also served as humidity indicators. On daily basis, the DBS cards together with transmittal forms were sent to designated laboratories within the district for storage at -20°C.

#### **6.1.9.3 HIV Rapid Testing**

Participants were provided with both pre and post-test counselling. HIV screening test was conducted following the national HIV rapid test algorithm. One drop of blood was collected to conduct HIV rapid test in the field using Determine Alere HIV rapid test kit as the initial test. Participants who tested non- reactive on Determine were given their HIV results as negative while those whose test results were reactive from the Determine test were further tested using Unigold HIV test. When Unigold test came out reactive as in the initial test, a parallel test was

done where Determine and Unigold test devices were performed simultaneously. This is referred to as confirmatory testing and all those participants who tested reactive on both Determine and Unigold in the parallel testing were reported as having a positive HIV status. These participants were referred for appropriate clinical care at the nearest health facility. Where Unigold test came out non-reactive when Determine tested reactive initially, participants were advised to visit the nearest HIV testing facility after 4 weeks for a retest. Upon return to the facility after the elapse of those 4 weeks, participants completed testing following the national HIV testing guidelines.

#### **6.1.9.4 HIV Laboratory Testing**

DBS specimens from all participants regardless of the status of the field test results were collected on to a filter paper and sent to the National HIV Reference laboratory (NHRL) for storage at -80°C. At the reference lab, all samples from HIV positive subjects were isolated, eluted and tested with Geenius HIV Confirmatory test. All samples that came out as indeterminate from the Geenius Confirmatory test were analysed qualitatively on Reverse Transcriptase- Polymerase Chain Reaction (RT-PCR) method. All remnant DBS specimens with consent for future testing were stored at -80°C for long term storage while those without were disposed by incineration.

#### **6.1.10 Quality Assurance of Survey and Laboratory Activities**

##### **6.1.10.1 Data Management and Analysis**

###### **6.1.10.1.1 Field Supervision**

Every field team had one supervisor. The supervisors were monitoring interview sessions and identified mistakes if any which were corrected before the respondent left the site. Electronic data files were transferred to the NSO central office in Zomba every day via the internet. Senior staff from the NSO; the Ministry of Health; National Aids Commission; and all Technical partners coordinated and supervised fieldwork activities. Data collection took place over a 3-month period, from 22 February to 6 April 2020 and 7 -19 June 2020.

Data collection tools were developed in CSPro 7.3. The questionnaire was designed with pre-programmed consistency checks for cross-checking responses, including skips and eligibility criteria.

###### **6.1.10.1.2 Data Cleaning Analysis**

Data was cleaned and analyzed using STATA 14, SAS 9.4, RDSAT, and SPSS 26. The data analysis focused on highlighting HIV prevalence and risk factors at district- and national-levels. Prevalence rates were calculated as the percentages of the blood samples that were positive and the results of these preliminary analyses were shared at a meeting with the BBSS steering committee and the HIV and AIDS Research and Surveillance TWG. The purpose of this meeting was to get information out as soon as possible and to use the experiences and knowledge of the

key stakeholders to assist with the interpretation of the data, and the development of recommendations for programmatic interventions and future data collection efforts.

#### **6.1.10.1.3 External Quality Assurance**

The 2019-2020 BBSS had an External Quality assurance (EQA) expert who was supported by the Global Fund office in Geneva. The EQA expert was responsible for reviewing the study protocol including questionnaires and manuals, SOPs, monitoring data collection processes, data cleaning, analysis and report writing. The EQA expert made an initial study visit to the implementing agency where among other things had a meeting with representatives from key populations. Due to Covid-19 travel restrictions, the EQA expert was unable to physically monitor data collection process instead there were weekly teleconference calls that provided updates of the progress of data collection process.

After field data collection, cleaning and analysis was completed, a copy of the electronic data sets were shared with the EQA expert. This enabled the expert to replicate the results and provide feedback where necessary to improve the quality of the results presented in this report.

#### **6.1.11 HIV Rapid Testing**

Quality Control (QC) in the survey was assured through supportive supervision of the data collection teams during fieldwork. The first level of supervision was provided by the teams' field supervisors. The field supervisors were responsible for closely monitoring the work of the teams to ensure that all eligible respondents were contacted and that questionnaires were edited in the field for accuracy and completeness. They also observed blood collection procedures in order to ensure that they were accurately being implemented. The second level of supervision was provided by selected district laboratory technologists in the districts where the study was being conducted and laboratory supervisors from the reference laboratory. These district laboratory technologists were trained in the survey procedures and have prior knowledge about essentials of quality management system surrounding HIV and Syphilis rapid testing. During the supervisory visits, remedial interventions were discussed with the interviewing teams which were aimed at identifying and addressing all non-conformities detected in the field work.

The NHRL provided all survey teams with enough QC specimens known as Dried Tube Specimens (DTS) which were performed routinely once a week and as needed during the whole study period. All supervisors monitored adherence to QC utilisation during their visits. Again, all Interviewers were given two rounds of HIV proficiency test samples to further ascertain their competencies during the survey duration.

All DBS specimens were checked and verified by team supervisor against the transmittal forms at site before sending them to the NHRL for logging and storage.

### **6.1.12 Syphilis Testing**

To ensure assay validity, a procedural control incorporated in the test device had to come out positive at each and every specimen run. If the control bar did not turn red by assay completion, the test result was invalid and the samples were retested. Supervision by laboratory technologists from both the district and the NHRL ensured that syphilis testing was conducted according to survey protocol as well as manufacturer instructions. All waste generated from the Syphilis and HIV rapid testing was collected and transported to district hospital for disposal by incineration on daily basis.

### **6.1.13 HIV Laboratory Testing**

Geenius confirmatory test controls which are commercially made known HIV positive and negative specimens were performed on weekly basis as part of the study samples. These control specimens had to register the given known result if study specimens were to be analysed each week.

The NHRL is enrolled in an External Quality Assurance (EQA) scheme with the National Health Laboratory Services (NHLS) of South Africa since 2003. The NHLS provides HIV proficiency test samples to the NHRL biannually and the laboratory has participated and passed in all distributions ever since.

In October 2020, the Southern African Development Community Accreditation Services (SADCAS) recommended the NHRL for accreditation having passed the initial assessment by the agency. SADCAS is multi-economy accreditation body established under terms of Article 15B of the Technical Barriers to Trade (TBT). Its primary purpose is to ensure that conformity assessment service providers (medical/testing laboratories, calibration, certification and inspection bodies) operating in SADC countries which do not have accreditation bodies of their own are subject to an oversight by an authoritative body. In this assessment, the NHRL applied to be assessed for accreditation in HIV confirmatory testing and Viral load testing using RT-PCR method.

### **6.1.14 Ethical Considerations**

#### **6.1.14.1 Institutional Ethics Clearance**

The BBSS study protocol was reviewed and approved by the National Health Sciences Research Committee (NHSRC) in Malawi before National Statistics Office (NSO) started implementation of the activities. Further permission was also obtained from the District Commissioners and the Directors of Health and Social Services for each district where data collection was done.

#### **6.1.14.2 Informed Consent**

Participation of all participants in this survey was strictly voluntary. Therefore, all study participants who met study eligibility criteria and were willing to participate in the oral interview, HIV testing, Syphilis testing and DBS collection provided oral informed consent before their participation. This was done to ensure that participants voluntarily participate in the study without any coercion. Oral consent was done instead of written informed consent to maintain confidentiality of the participants who are considered to be high risk and prone to exploitation. The consenting process was done one-on-one at a private place either in Chichewa or English depending on the participant preference. Through consenting process, participants were informed about the purpose of the study, study procedures, its direct and indirect benefits to them and their peers and risk for taking part in the study. Participants were also allowed to ask questions related to the study if any and were informed that they could stop their participation at any time during the interview without any problems. The study also included FSW and MSM who were under 18 years. These provided oral assent since in this study they were classified as emancipated minors because of the nature of their work.

During informed consent process, participants were also asked if they are willing to be tested for HIV and syphilis. Participants were also informed that once the results test reactive another finger prick has to be performed for the second HIV testing. They were also told the importance of testing key populations for HIV and Syphilis and assured them that the blood samples tested for HIV and syphilis would only be linked to their unique numbers not their names. They were further assured that the sterile lancet for pricking would be used only once by a trained HTS counsellor and the physical risk is extremely minimal.

Once the participant agreed, the interviewer signed two copies of the approved consent form in the presence of the participant as witness and the participant was given a copy of the signed consent form. All signed copies were kept at a secure place by the supervisor for record keeping. The field team would only commence data collection when consent was given by the participant. All potential participants who were not willing to provide consent were thanked for their willingness to participate and no study procedures were conducted. For FSW and MSM the coupons were retrieved from them to avoid them giving to another person. Reasons for declining were also documented accordingly.

#### **6.1.14.3 Oral Interviews**

This study used Respondent Driven Sampling (RDS) method of data collection to capture targeted FSW and MSM populations who are mostly hidden and hard to reach and Time Location Sampling (TLS) for Clients of FSW. With RDS method, participants are recruited by their peers to a specific location where the interview is conducted. Prior to start oral interviews the research team conducted consultative meetings with district local authorities and key population implementing partners in all the 8 districts. The aim was to describe the study objectives, obtain approval to conduct the study in the district and work with them to identify



study locations to ensure maximum confidentiality within the district where oral interviews and biomarker testing could be conducted.

The research team also took advantage of these meetings to identify trained social mobilizers/peers working with some implementing partners like FPAM and CEDEP who helped distribution of unique objects as part of the recruitment process. The team then visited potential interview venues to seek permission from the owners. They also verified whether there were enough rooms to conduct interviews as well as HIV and syphilis testing and specific days when the interviews can be done at the venue. Interviews were scheduled on less busy days to maintain confidentiality of participants coming for interviews.

On the day of the interview, only FSWs and MSM presenting with study coupons were allowed to enter the interview venue. This was done to ensure that only the targeted population is allowed and interviewed as per study protocol requirements. Due to the sensitivity of the data collected during the interview such as HIV, STI, Sexual and reproductive history, before the interview, the interviewer ensured maximum confidentiality of the room where the interview was taking place and reiterated to the participant that all information collected during the interview would be confidential. They were further informed that any data collected would not be linked to their names but they would be assigned a unique number; hence other people would not know that they participated in this study. Participants were also assured that they would never be identified in any publications or reports related to this study without their permission. All interviewers were also cautioned against discussing anything that transpired during the interview with individuals directly or indirectly involved in the study.

To ensure maximum security of data collected using the tablet, all interviewers were advised to securely keep their tablet while in the field, that is to always keep them in their bags when not in use and not to leave the tablet and other study documents unattended. They were further informed not to use the tablets for other purposes such as phone calls and access to social media especially outside field work. To minimize access to the data collected through oral interviews by others, each tablet was encrypted with a unique password which was only known to the interviewer assigned to a specific tablet, Supervisors and Officers from National Statistical Office.

#### **6.1.14.4 Sample Collection for HIV and Syphilis Testing**

Before blood sample collection for HIV and syphilis testing using a finger prick, clients were counselled by well-trained HTS counsellors for them to understand what it means to be tested for HIV and why it was important for them to have the test. Further participants were told that there were minimal risk of bleeding and bruising related to this procedure of collecting samples. To minimize this, trained medical personnel were recruited and trained to draw blood and ensured adequate supply of new, sterile disposable needles, following HTC national standards. Laboratory technologists from NHRL provided continuous supervision to the HTS counsellors. This was done to ensure that the tests were done following the MOH guidelines, there is proper

documentation and also to make sure that they have all the necessary supplies to effectively conduct the tests. Efforts were put in place to minimize the risk of needle stick injury among the blood collectors or exposure to potentially infectious blood. Training was also provided to them on infection prevention and how to refer needle prick injured personnel to accredited health facility for assessment and possible post exposure prophylaxis (PEP).

#### **6.1.14.5 Providing HIV and Syphilis Test Results**

All participants who were tested for HIV and syphilis were supposed to be given their rapid test result when the results were ready that is after 15 minutes. Receiving HIV and Syphilis positive results may cause some psychological trauma to the participant especially dealing with lifelong dependency on medication, stigma and how to protect other sexual partners. On the other hand, those participants who test negative might be worried on how they can remain negative due to having multiple sexual partners which is common among the study target groups. HTS providers were reminded the importance of pre- and post-testing counselling, risk reduction measures and referral for ART. The counselling and referral system were done following The National Testing and Counselling protocol (pre-test counselling, risk assessment and reduction, post-test counselling and referral). All participants who tested positive for either HIV or Syphilis rapid test were referred to the nearest health facility of the client choice.

#### **6.1.14.6 Physical Risk**

Any research work involving key population poses challenges to both the researcher and the participant. This study targeted FSWs, MSM and CoFSW who are highly stigmatized. All precaution measures were put in place to ensure that both the researcher and the participants are protected from any harm related to their participation in this study. The team also engaged district local leaders including the Police who were briefed about the study and the possible interview venues. The police identified specific officers within the district who the research team could call in case of danger while in the field. Before data collection started, interviewers were also advised to always put on their NSO Identity cards every time they were in the field and always to report any strange behavior within the surround interview venue.

The team also created a WhatsApp group that included all BBSS data collectors and supervisors whereby all suspected physical risks were reported and proper advice was given to them by the members. All issues that could pose risks to specific groups of people like issues of Blood suckers which were common in some districts were also posted on the group for the team members to be extra careful while in the field. It is also common for study participants to get attracted to both male and female interviewers and our interviewers included members of the target population (MSM). To minimize this, during training interviewers were told the importance of proper dressing while in the field and also to report any sexual harassment by the clients to the supervisors.

## **6.1.15 Limitations of the Study**

### **6.1.15.1 Recruitment of participants**

In the BBSS, FSW and MSM were enrolled by using peer recruitment as such a participant could potentially be recruited more than once into the study, but a screening form was used to determine eligibility, with one criteria being that they did not participate in the study previously. In order to minimise recruitment more than once, participants were asked before taking part in the study if they have been interviewed by one of the study teams in the weeks and enter a unique code in the RDSCM to see if they had already participated.

### **6.1.15.2 Non-response**

For FSW and MSM, the survey established RDS interview sites where interviews took place. These were agreed upon with representatives of the key population as such participation rate was very high. The study also was giving out transport refunds and peer recruitment allowance and this resulted in high response rate in most interview sites. In some areas, participants could not participate fully for fear of being stigmatized. Measures were put in place to ensure that interviewers respected the participants' preferred time schedules. Furthermore, the study coordinators constantly monitored response rates by checking successful interviews against the required number of interviews for each interview site.

### **6.1.15.3 Coverage**

The survey did not cover all the potentially high-risk and vulnerable groups in the country. As such the results from this survey may not be representative of all the key populations at national level. The study also did not cover all of the districts in the country, however, it did cover districts in each of the three regions and included the districts with the largest clusters of FSW and MSM. The study could not cover the allocated sample sizes in every district due to community hostility because of blood sucking myths. RDS diagnostics did not flag any major recruitment issues, except that In Blantyre, the proportion of FSW who reported receiving a bracelet (94%) suggests that bracelets were not distributed throughout Blantyre and that recruitment in Blantyre did not reach past the areas where the bracelets were distributed.

### **6.1.15.4 Self-Report**

Like in most other behavioural surveys, the issue of under-reporting risk behaviours among participants of this study must be considered. Due to social stigma, some behaviours, such as condom use, drug injection or needle sharing may be under-reported by respondents. Many efforts were made to limit this bias. All interviews were conducted in private places, surveys were anonymous, and respondents were encouraged to provide accurate responses. Still, some indicators of risk behaviours are likely conservative estimates.

### **6.1.15.5 Survey Design**

One major limitation of this survey is that it followed a cross-sectional design. In cross-sectional studies, it is difficult to explain causality in both observed behavior and status. On the use of RDS, one advantage is that sampling frame is built up during the recruitment process and this helps to avoid incomplete sampling frames, as it happens in the cluster sampling method. However, there are several key assumptions and operational issues to be looked into. These include the influence of non-response bias, selection of seeds, an assumption of random selection within a network of target populations, and others. Until these issues are clarified, unknown biases may affect estimates generated from samples using RDS.

### **6.1.15.6 Exclusion and Inclusion**

During recruitment of target population for participation in the survey, it could be possible to include some members who were not part of that targeted key population. On the other hand, the screening tools could fail to identify some of the members of the targeted population. This could affect representativeness of the survey for the key populations at national level.

### **6.1.16 Covid-19 Effect on Survey.**

The Covid-19 pandemic interrupted data collection between April 6 and June. The interruption may have affected participation in the survey and should be taken into account during interpretation of the findings. Among the ways that the pandemic may have affected the results are the following:

- The delay may have affected recruitment. Recruitment into the survey was done through respondent driven sampling. Usually, respondents can recruit their peers almost immediately after they have participated without delays in the recruitment chain. After the survey was suspended due to Covid-19 risk, people may have lost their recruitment coupons.
- Anecdotal reports suggest that venue visiting behaviors decreased during the initial period of the pandemic in Malawi. People who might have been sampled for the survey may have moved away or out of communication with those who may have recruited them. It is not known to what extent people who moved away were different from those who stayed.
- The method for size estimation suffered because people may have forgotten that they received a unique object or people who received a unique object may have moved away. Not all districts conducted surveys after the Covid delay. Those that did found that fewer people reported receiving a bracelet that in the period prior to the delay. We adjusted the capture-recapture estimate in these districts by only including people interviewed before the survey. Consequently, the sizes that are estimated reflect the pre-Covid population rather than post-Covid population.

- Since the Covid interruption resulted in the study ending without achieving its full sample size. Consequently, some of the sub-group analyses may not have sufficient size to give as precise an estimate as was initially planned.
- The laboratory was focused on Covid and other laboratory work and consequently there was a delay in obtaining HIV and the viral load test results. As of the time of the submission of this report in December 2020, the viral load results were not yet available.

## 6.2 Appendix 2: Additional Information on the Extrapolation Methods

Additional information on the extrapolation methods is included below. The methods described were applied separately for estimation of FSW and MSM population sizes.

First, we fit a Poisson regression model to estimate  $Y$ , the count of key population members in the districts where direct size estimates were available, conditional on a set of contextual variables  $Z$ .

The form of the Poisson model was  $\log(Y) = \log(n) + \gamma_0 + \gamma_1 g(Z)$ . For FSW size estimates, the contextual variables included, for each district: the male to female ratio, computed as the male population of age 15 to 49 divided by the female population of age 15 to 49; an indicator of high HIV prevalence among women, based on whether the approximate proportion of women on ART was at least the median value or below (with the proportion computed by dividing the number of women in the district on ART by the number of women age 15 to 49 in the district); and an indicator of the presence of mines, tea estates, or military barracks. For MSM size estimates, the contextual variables included, for each district: an indicator of high HIV prevalence among men, based on whether the approximate proportion of men on ART was at least the median value or below (with the proportion computed by dividing the number of men in the district on ART by the number of men age 15 to 49 in the district); an indicator of the presence of mines, tea estates, or military barracks; and an indicator of the presence of an international border crossing.

Next, we drew a set of regression coefficients for each of  $K=100$  imputations from the posterior distribution of the parameters  $\gamma$ . For districts without direct size estimates, we estimated  $Y_k$ , the count of key population members  $Y$  in each imputation  $k$ , using the Poisson regression model for the  $Y$  and  $Z$  relationship and the set of regression coefficients  $\gamma^k$  drawn in the imputation. Specifically, estimates were computed according to the equation:  $Y_k = \exp [\log(n) + \gamma_0^k + \gamma_1^k g(Z)]$ . For districts with direct estimates, the direct size estimate was used, such that for all imputations for these districts,  $Y_k = Y$ . Iteratively drawing regression coefficients and estimating  $Y$  allowed us to account for uncertainty associated with the parameter estimates and propagate this uncertainty through to the confidence intervals around the final estimates. In conducting the imputations, we assumed that the parameters followed a multivariate normal distribution with mean vector  $(\hat{\gamma}_0, \hat{\gamma}_1)$  and covariance matrix  $\Sigma_Z$ .

We then fit an analysis model of the form  $\log(E[Y^k]) = \log(n) + a^k$  in each of the 100 imputed data sets, where  $a^k$  represents, in imputation  $k$ , the natural log of the proportion of women (for FSW) or men (for MSM) age 15 to 49 who are members of the key population. We used data from the  $K=100$  imputations for all districts of Malawi to produce the national size estimates. To produce regional estimates and those for districts, we fit an analysis model to each relevant subset of imputations.

Finally, we summarized parameter estimates across analysis models for inference. The pooled proportion of women (for FSW) or men (for MSM) who are members of the key population  $\bar{\mu}_K$ , i.e., the mean proportion across  $K$  imputations, was estimated as  $\exp(\bar{a}_k) = \exp\left(\frac{1}{K} \sum_{k=1}^K \hat{a}^k\right)$ .

The total variance for  $\bar{\mu}_K$  was given by summing the within- imputation and between-imputation variance components according to Rubin's rules for a pooled estimator<sup>3</sup>:

$$V(\bar{\mu}_K) = \frac{1}{K} \sum_{k=1}^K \hat{V}(\hat{a}^k) + \left(\frac{K+1}{K}\right) \left(\frac{1}{K-1}\right) \sum_{k=1}^K (\hat{a}^k - \bar{a})^2$$

All national and districts direct and extrapolated size estimates and corresponding 95% confidence limits for the imputed estimates are provided.

An entry of "N/A" for a bound indicates a locality where a direct estimate was available and imputation was not required.

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<sup>3</sup> Little, R. J. A., and D. B. Rubin. 2002. *Statistical Analysis with Missing Data*. 2<sup>nd</sup> ed. Hoboken, NJ: Wiley.

**Table 23: Female Sex Worker size estimates and confidence bounds: national, regional and district estimates**

Area	Number of women ages 15 to 49	Estimated % of women engaged in sex work	Percentage: Lower bound	Percentage: Upper bound	Rounded estimate of the number of FSW	Number: Lower bound	Number: Upper bound
Malawi, overall	4,349,829	0.8	0.8	0.9	36,100	35,500	37,100
<b>Regional estimates</b>							
North	568,900	1.0	1.0	1.0	5,700	5,400	5,900
Central	1,868,254	0.9	0.8	0.9	16,200	15,800	16,800
South	1,912,675	0.7	0.7	0.7	14,300	14,000	14,700
<b>Sub-regional estimates</b>							
Chitipa	57,391	1.0	0.9	1.0	500	400	700
Karonga	91,703	1.3	N/A	N/A	1,200	N/A	N/A
Nkhata Bay	68,375	1.1	N/A	N/A	700	N/A	N/A
Rumphi	55,648	1.0	0.9	1.1	500	400	600
Mzimba	226,936	0.9	0.9	1.0	2,100	2,000	2,300
Likoma	3,889	1.1	0.8	1.5	< 100	< 100	100
Mzuzu City	64,958	0.8	0.7	0.8	500	400	600
Kasungu	202,935	1.0	0.9	1.1	2,100	1,900	2,300
Nkhotakota	95,154	1.0	0.9	1.0	900	800	1,000
Ntchisi	75,828	1.0	0.9	1.1	700	600	900
Dowa	190,031	1.0	0.9	1.0	1,900	1,700	2,000
Salima	113,990	0.9	0.9	1.0	1,100	1,000	1,200
Lilongwe Rural	398,838	0.8	0.7	0.8	3,000	2,800	3,200
Mchinji	144,570	0.5	N/A	N/A	800	N/A	N/A
Dedza	203,380	0.9	0.9	1.0	1,900	1,700	2,100
Ntcheu	158,868	1.0	0.9	1.0	1,500	1,400	1,700
Lilongwe City	284,660	0.8	N/A	N/A	2,400	N/A	N/A
Mangochi	269,300	0.7	N/A	N/A	1,900	N/A	N/A
Machinga	168,598	0.9	0.8	1.0	1,500	1,400	1,700
Chiradzulu	89,533	0.7	0.7	0.8	600	500	700
Blantyre Rural	114,567	0.7	0.7	0.8	900	700	1,000
Mwanza	32,643	1.9	N/A	N/A	600	N/A	N/A
Thyolo	182,649	0.7	0.7	0.7	1,300	1,100	1,400
Mulanje	169,169	0.7	0.7	0.8	1,200	1,100	1,300
Phalombe	99,964	0.7	0.7	0.8	700	600	900
Chikwawa	135,257	0.7	0.7	0.8	1,000	900	1,100
Nsanje	70,237	0.7	0.6	0.8	500	400	600
Balaka	104,793	0.7	0.6	0.8	700	600	800
Neno	33,436	0.7	0.6	0.8	200	200	300
Blantyre City	230,946	0.8	N/A	N/A	1,800	N/A	N/A
Zomba	211,583	0.6	N/A	N/A	1,200	N/A	N/A



**Table 24: Men who have Sex with Men size estimates and confidence bounds: national, regional and district estimates**

Area	Number of men ages 15 to 49	Estimated percent of Men who have Sex with Men	Percentage: Lower bound	Percentage: Upper bound	Rounded estimate of the number of MSM	Number: Lower bound	Number: Upper bound
Malawi, overall	4,070,008	0.6	0.6	0.6	23,200	22,400	24,100
<b>Regional estimates</b>							
North	533,001	0.4	0.4	0.4	2,300	2,000	2,400
Central	1,801,542	0.6	0.6	0.6	10,600	10,000	11,000
South	1,735,465	0.6	0.6	0.6	10,400	10,200	10,900
<b>District estimates</b>							
Chitipa	53,400	0.1	0.1	0.2	100	< 100	200
Karonga	84,864	0.3	N/A	N/A	300	N/A	N/A
Nkhata Bay	65,639	0.9	N/A	N/A	600	N/A	N/A
Rumphi	53,688	0.3	0.3	0.4	200	100	300
Mzimba	208,068	0.3	0.2	0.3	500	400	700
Likoma	4,193	0.3	0.2	0.5	< 100	< 100	100
Mzuzu City	63,149	0.8	0.7	0.9	500	400	600
Kasungu	200,078	0.4	0.4	0.5	900	700	1,100
Nkhotakota	90,428	0.9	0.8	1	900	700	1,000
Ntchisi	72,947	0.4	0.4	0.5	300	200	400
Dowa	184,627	0.4	0.4	0.5	800	600	1,000
Salima	104,952	0.9	0.9	1	1,000	800	1,100
Mchinji	141,585	0.1	0.1	0.2	200	100	300
Dedza	184,010	0.3	0.3	0.4	600	400	700
Lilongwe	673,496	0.8	N/A	N/A	5,500	N/A	N/A
Ntcheu	149,419	0.3	0.2	0.3	400	300	500
Mangochi	228,169	0.6	N/A	N/A	1,300	N/A	N/A
Machinga	146,422	0.4	0.4	0.5	600	500	800
Chiradzulu	80,719	0.8	0.7	0.8	600	500	700
Mwanza	31,012	0.1	0.1	0.2	< 100	< 100	100
Thyolo	156,947	0.8	0.7	0.8	1,200	1,100	1,400
Mulanje	150,101	0.3	0.2	0.3	400	300	500
Phalombe	92,720	0.3	0.2	0.3	200	200	300
Chikwawa	130,298	0.8	0.7	0.8	1,000	900	1,100
Nsanje	63,533	0.3	0.2	0.3	200	100	300
Balaka	91,846	0.8	0.7	0.8	700	600	800
Neno	31,183	0.8	0.7	0.9	200	200	300
Zomba	190,334	0.8	N/A	N/A	1,600	N/A	N/A
Blantyre	342,181	0.7	N/A	N/A	2,300	N/A	N/A

### 6.3 Appendix 3: Design 2-Stage Capture-Recapture

Estimating the number of Female Sex Workers and Men who have Sex with Men is one of the major objectives of the BBSS.

The size estimation method is two-stage capture recapture based on distribution and reporting of having received a unique object. The protocol anticipated a 3-stage capture recapture design implemented as part of a venue-based mapping and sampling strategy, but the design was changed to a 2-stage capture-recapture when the sampling strategy changed to RDS and there were implementation delays.

The unique object used for the capture-recapture was a distinctive bracelet. Bracelets were mostly distributed by peers.

The survey began immediately after distribution of the bracelets. The survey included questions about receiving the unique object including whether they had the bracelet with them and could show it to the interviewers, if they could accurately point to a picture of the bracelet, and how many bracelets the person received. Some of the women reported receiving multiple bracelets even though the training stressed that only one bracelet should be provided to each respondent.

The questions to FSW were the following:

- Q3\_4 Did you receive the unique object?
  - Yes, No, Refuse, Don't Know
- Q3\_5 Asked to everyone: Can you show the object you received?
  - Cannot show, shows the wrong object, shows the right object
- Q3\_6 Can you identify the objects from this picture?
  - Correctly identified, could not correct identify
- Q3\_7 How many objects did you receive?
- Q3\_8 Who gave you the object?
  - Peer educator, friend, sex partner, random person, bar owner/bartender
- Q3\_9 Was unique object free or bought?
  - Free, bought

FSW who were interviewed during the survey were defined as a "recapture" if they were sampled for the survey and reported receiving the object during the distribution phase. Specifically, a "recapture" was defined as someone who could show the right object (Q3\_5) or reported receiving the object (q3\_4=1) and could correctly identify the object (Q3\_6=1). FSW who had a missing number of unique objects reported or zero objects for the answer to q3\_7 were assumed to have received 1 object.

The questions to MSM about receiving the unique object were slightly different. The questions to MSM were the following:

- Q3\_5 Did you receive the unique object?
  - Yes, No, Refuse, Don't Know
- Q3\_6 Who gave you the object?
  - Peer educator, Other, Refuse, Don't Know
- Q3\_7 Where did you receive the bracelet?
  - In current district, Outside district, Refuse

MSM were defined as receiving the object if they answered Yes to q3\_5 regardless of their answers to the other questions. Only 5 reported receiving the bracelet outside of the district.

According to the protocol, if a 3-stage design had been used:

"Population size estimates and credibility intervals will be derived using a Bayesian nonparametric latent-class model for 3-source capture-recapture. Analysis will be performed using a shiny app (available from CDC Atlanta) for analyzing 3S-CRC data." Instead the Chapman estimate for 2-stage capture-recapture analysis was used.

This is very similar to the simple Lincoln-Chen estimate or Petersen estimate.

The **Chapman model** (Chapman 1951) for estimating population size was modified from the Lincoln-Peterson model and produces estimates with less bias (i.e., more accurate estimates of the true population size) using the following equation:

$$\hat{N}_c = \left[ \frac{(n_1 + 1)(n_2 + 1)}{(m_2 + 1)} \right] - 1$$

The variance of the Chapman-modified estimate of population size is calculated with:

$$\text{var}(\hat{N}_c) = \frac{(n_1 + 1)(n_2 + 1)(n_1 - m_2)(n_2 - m_2)}{(m_2 + 1)^2 (m_2 + 2)}$$

where:  $\hat{N}_c$  = estimated population size  
 $n_1$  = total number captured and marked in first capture event  
 $n_2$  = total number captured in second capture (or resight) event  
 $m_2$  = number recaptured in second capture event

The variance can be used to approximate a 95% confidence interval for the population estimate using the following equation:

$$\hat{N}_c \pm 1.965 \sqrt{\text{var}(\hat{N}_c)} \quad (\text{e.g., written as: } \hat{N} = 34 \pm 7)$$

**References:**  
 Chapman, D. G. 1951. Some properties of the hypergeometric distribution with applications to zoological censuses. University of California Publications in Statistics 1:131-160.

### 6.3.1 Distribution of Objects and Implementation Issues

The unique objects were distributed over a 2-week period beginning February 22 just prior to survey implementation. Peer educators distributed the bangles to the FSW and kept records of the number of bangles distributed. After the survey was completed, information on the distribution of the unique objects was compiled by the NSO. Some problems with bangle distribution were noted. For example, peer educators did not always document that the person receiving the unique object was an FSW and sometimes gave unique objects to FSW to pass on

to other FSW. The survey staff noticed bar men and other people who were not FSW were wearing the bracelet. These people may have been given a bracelet by an FSW who did not want her bracelet anymore.

Giving away a bracelet to a bar man would not necessarily affect the results if the FSW reported receiving it. Giving the bracelet to another FSW might affect the results if both FSW were reporting receiving the same bracelet. This would cause the estimate to be underestimated. It is unclear if there was explicit distribution of bracelets to people who were not FSW/MSM or just that some FSW/MSM happened to give away their own bracelet to friends. Peer educators were trained to tell people to keep the bracelet so it is possible that the bias arising from sharing bracelets is minimal.

The survey team also requested that peer educators return bracelets that were not distributed or at least report how many bracelets were not distributed. No bracelets were returned, but peer educators provided counts of the number of bracelets actually distributed to FSW. In the survey, FSW were asked how many bracelets they received. MSM were not asked how many bracelets they received.

The survey was stopped April 6 due to COVID. The study was resumed June 7-19 in Lilongwe and Zomba only. Consequently, some of the respondents were asked in June about a bracelet they may have received in February before the COVID epidemic. The proportion of respondents interviewed in June differed by district.

### **6.3.2 Female Sex Worker Size Estimation Results**

#### **Initial FSW Size Estimates**

The initial calculations for FSW are shown below.

- Column 1: District;
- Column 2: Target sample size for number of FSW to Interview;
- Column 3: Double the sample size indicating the initial number of target bracelets;
- Column 4: FSW who reported getting bracelet during survey;
- Column 5: Number of interviewed;
- Column 6: Initial estimate assuming target distribution in column 3 (which was too large);

**Table 25: Initial Female Sex Worker size estimates**

District	Sample Target for Survey	Target Number of Objects to Distribute	Number interviewed who Reported Bracelet	Total Number Interviewed	Initial Unadjusted Estimate based on Target distribution
1	2	3	4	5	6
<b>Blantyre</b>	906	1,812	354	375	1919
<b>Karonga</b>	666	1,332	155	226	1942
<b>Lilongwe</b>	906	1,812	175	472	4887
<b>Mangochi</b>	666	1,332	134	306	3042
<b>Mchinji</b>	510	1,020	301	386	1308
<b>Mwanza</b>	510	1,020	375	439	1194
<b>Nkhata Bay</b>	510	1,020	202	305	1540
<b>Zomba</b>	906	1,812	250	594	4305
<b>Total</b>	5,580	11,160	1,946	3,103	20,138

**FSW Estimate Adjusted Because Some Bracelets Were Not Distributed**

FSW estimates were adjusted because some bracelets were not distributed. Corrected number of bracelets distributed were obtained from peer educators. The number of people receiving a bracelet was also decreased based on the number of people who reported receiving more than one bracelet.

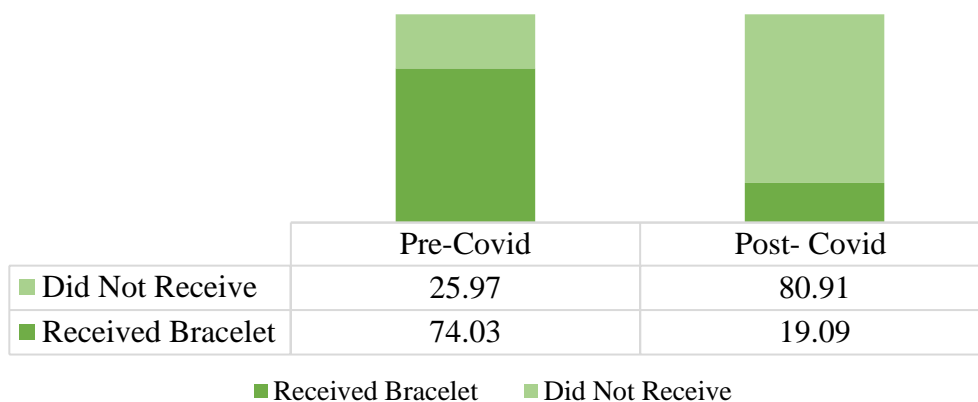
This approach seems reasonable except for Mwanza where more FSW were interviewed than the size estimate (439 were interviewed but the size estimate is 399). Consequently, this adjustment was not done for Mwanza. For the RDS analysis and calculation of weights, the size estimate used in Mwanza was 600 based on the following: without the multiple-bracelet adjustment in Mwanza, keeping as valid the 525 bracelets distributed as originally reported, then the size estimate for Mwanza would be 600 (rounded from  $615 = 439 * 525 / 375$ , = 439 people interviewed \* 525 bangles distributed / 375 reporting a bangle). The method used to calculate weights for the FSW and MSM samples was Gile's Sequential Sampler method implemented as part of RDS Analyst software.

**Estimate Adjusted Based on Phase of Survey: Pre vs Post COVID**

There was a large difference in pre-vs post COVID reporting of unique objects. 74% of 2,464 FSW reported receiving a bracelet pre-COVID and only 19% of 639 after the study resumed. The two districts with data collection in July post-COVID were Lilongwe and Zomba. The difference pre vs post COVID for bracelet receipt is significant ( $p < 0.0001$ ). The team discussed the fact that fewer people reported the bracelet after the interruption of the survey for a few

months and decided to base the size estimate on the pre-COVID period. Column 5 in Table below is the revised size estimate.

**Figure 44: Pre vs Post Covid reporting bracelets**



**Table 26: Adjustment to keep Pre-COVID participants only**

District	Number of Objects Distributed Adjusted	Number interviewed Pre-Covid who Reported Bracelet	Total Number Inter-viewed	Further Adjusted to Pre-COVID
1	2	3	4	5
<b>Blantyre</b>	1235	354	375	1,309
<b>Karonga</b>	813	155	226	1,186
<b>Lilongwe</b>	1490	104	170	2,417
<b>Mangochi</b>	833	134	306	1,903
<b>Mchinji</b>	600	301	386	770
<b>Mwanza</b>	525	375	439	615
<b>Nkhata Bay</b>	486	202	305	733
<b>Zomba</b>	979	199	257	1,225
<b>Total</b>	6,778	1,946	3,103	9,942

### 6.3.3 Variability in proportion of FSW receiving an object by district

Note that in Blantyre, 94% of the FSW interviewed reported receiving a bracelet. This high percentage suggests that pockets of FSW in Blantyre were missed during bracelet distribution. The high proportion reporting a bracelet suggests that there was too much overlap between the people who received the bracelets and the people who were surveyed. At least one of these two groups should have been a random sample of FSW and the two samples should have been

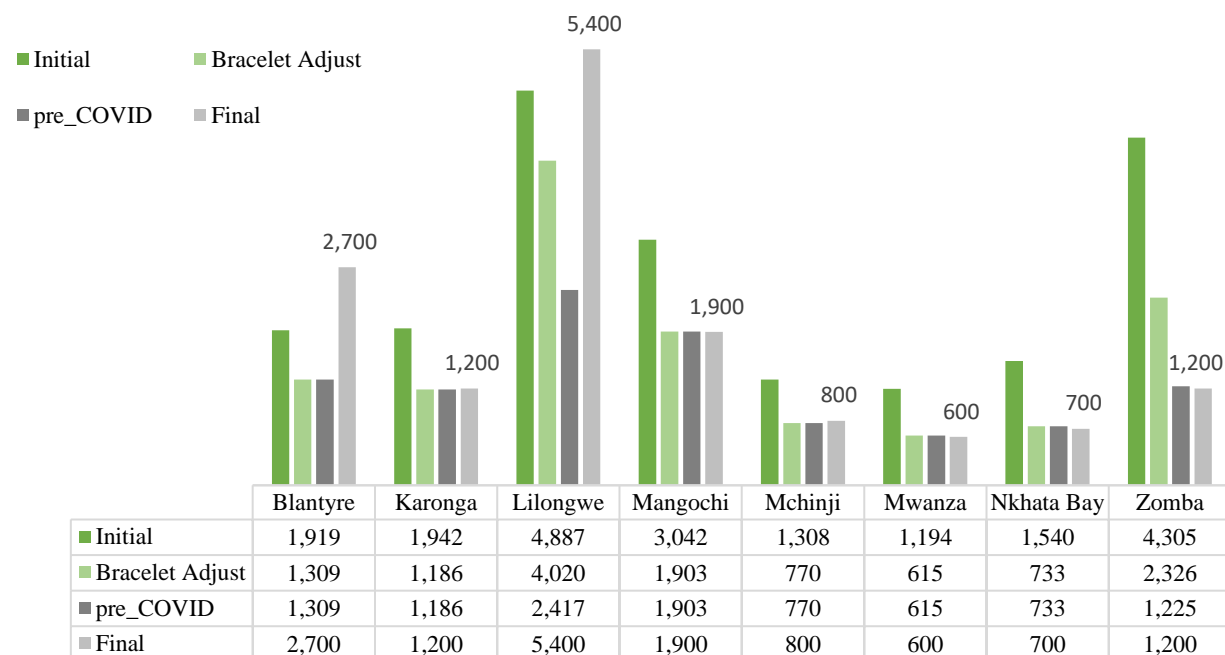
independent. As noted above, the percent of FSW who reported receiving a bracelet during Phase 2 after the COVID-19 hiatus was much lower than before the study was suspended.

**Table 27: High proportion receiving a bracelet in Blantyre**

District	% of FSW Reporting Receiving object	% of FSW Reporting Receiving object	Total
	Pre-COVID	Post -COVID	
<b>Blantyre</b>	94	n/a	94
<b>Karonga</b>	69	n/a	69
<b>Lilongwe</b>	61	24	37
<b>Mangochi</b>	44	n/a	44
<b>Mchinji</b>	78	n/a	78
<b>Mwanza</b>	85	n/a	85
<b>Nkhata Bay</b>	66	n/a	66
<b>Zomba</b>	47	15	42

The Figure below shows the final FSW size estimates described above (initial estimate, adjusted based on a more accurate bracelet count, and limited to pre-COVID surveys). Final estimates for Lilongwe and Blantyre reflect adjustments that increased the size estimate based on the assessment that the previous estimates were too low and did not adequately take into account the rural part of the district.

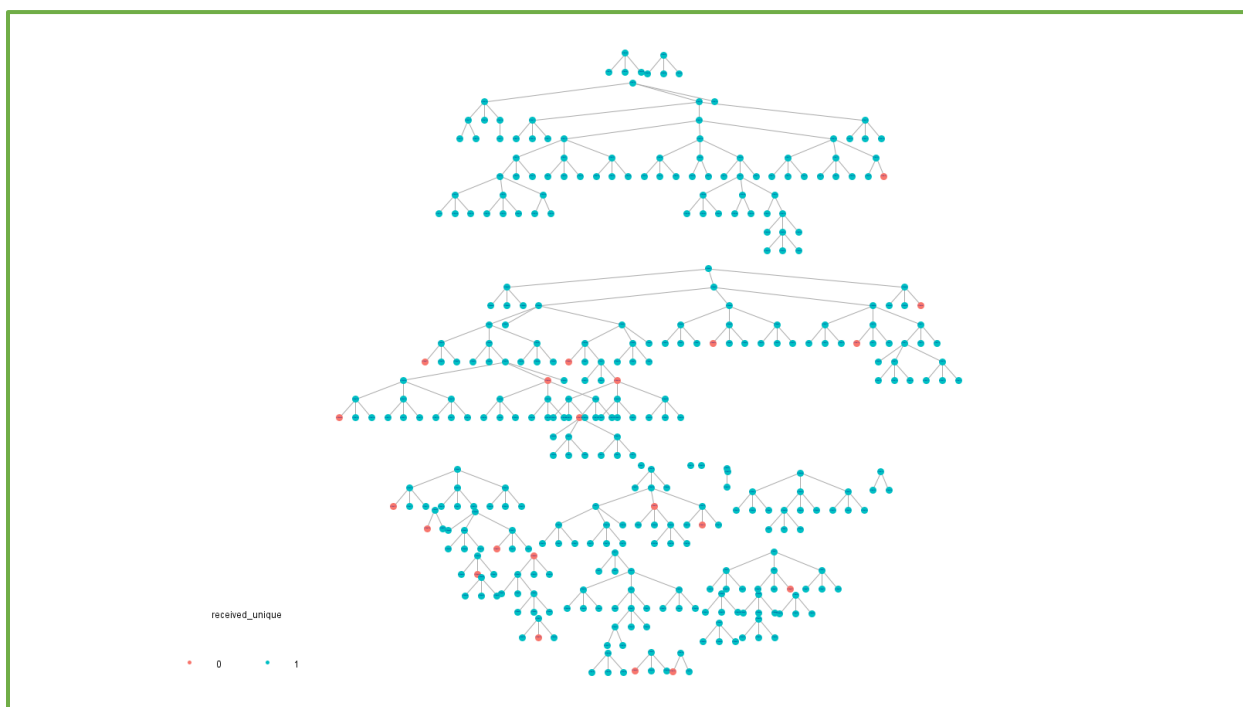
**Figure 45: FSW size estimates by district**



### 6.3.4 FSW Recruitment Trees in Blantyre

Below are the recruitment trees for Blantyre. The red dots represent the 21 FSW who did not report receiving a unique object. One possible reason why there was such a large overlap between the people given the bracelets and the people responding to the survey is that venue mapping was not done in Blantyre District. In every other district venue mapping was done. Bracelets were distributed at venues and interviewers were recruited by FSW seeds who were initially recruited at venues. In districts other than Blantyre, the recruitment benefitted from having a wider array of venues and venues possibly in areas less well known to the peer educators.

**Figure 46: Blantyre FSW Recruitment Chains with 94.4% who Reported Unique Object**



### 6.3.5 Men who have Sex with Men Size Estimation Results

#### Initial MSM Estimates

All of the bracelets were distributed according to the field staff so the estimate was not adjusted for bracelets that were not distributed. MSM were not asked how many bracelets they received so there was no adjustment for receiving multiple bracelets. Number of MSM enrolled in the CEDEP MSM program were used to compare with initial size estimates. These figures suggest that the Blantyre estimate is too low.



**Table 28: Initial Men who have Sex with Men size estimates**

District	Target Sample Size	Bangles Actually Distributed	Number of Respondents with a Bracelet	Number of Respondents	Capture-Re-Capture Size Estimate	Number of MSM enrolled in CEDEP
<b>Blantyre</b>	810	1620	307	440	2322	7,713
<b>Karonga</b>	100	200	64	85	266	--
<b>Lilongwe</b>	810	1620	171	582	5514	6,132
<b>Mangochi</b>	300	600	139	298	1286	1,745
<b>Mchinji</b>	n/a					--
<b>Mwanza</b>	n/a					--
<b>Nkhata Bay</b>	200	400	119	184	618	659
<b>Zomba</b>	400	800	186	376	1617	--

## 6.4 Appendix 4: Weighted and Unweighted HIV and Syphilis Prevalence by Age

**Table 29. HIV and syphilis prevalence weighted and unweighted**

Key Population	HIV Prevalence		Syphilis Prevalence		N
	Unweighted	Weighted	Unweighted	Weighted	
<b>Female Sex Worker</b>					
<b>15-19</b>	23.1	21.5	8.2	8.3	256
<b>20-24</b>	37.8	37.7	27.9	28.7	924
<b>25-29</b>	54.7	51.7	37.5	38.4	901
<b>30-34</b>	59	59.6	38.3	38.5	541
<b>35 +</b>	68.2	66.8	38.9	37.1	481
<b>All</b>	49.9	48.7	32.6	32.8	3,103
<b>Men who have Sex with Men</b>					
<b>15-19</b>	3.5	3.3	3.5	3.8	200
<b>20-24</b>	4.2	3.0	5.1	3.5	806
<b>25-29</b>	13.1	15	10.8	12.7	474
<b>30-34</b>	18.1	19.4	14.5	16.0	227
<b>35 +</b>	41.5	40.5	17.4	16.6	258
<b>All</b>	12.8	12.2	9.0	8.5	1,965
<b>Clients of Female Sex Worker</b>		n/a		n/a	
<b>15-19</b>	1.7		1.7		115
<b>20-24</b>	4.6		4.7		657
<b>25-29</b>	9.7		7.4		558
<b>30-34</b>	13.3		9.6		333
<b>35 +</b>	24.8		9.6		560
<b>All</b>	12.1		7.2		2,223

## **6.5 Appendix 5: RDS Recruitment Monitoring**

RDS Analyst (RDS-A) software package was used for analysis of Respondent-Driven Sampling data for Female Sex Workers and Men who have Sex with Men. It was used for monitoring and ending RDS recruitment.

Monitoring recruitment helps us identify whether:

- RDS assumptions are being met
- The sample is sufficiently diverse and subpopulations have been reached
- Homophily is low
- We are reaching sample size
- Some groups are not coming to the survey site

Monitoring also help identify problems with missing or incorrect data.

Several RDS-A recruitment diagnostics were used to determine if RDS assumptions are met. These include homophily, bottleneck plots and recruitment trees (recruits by wave, recruits by seed and convergence plots)

### **6.5.1 Homophily**

This is the tendency for people to socialize with similar people and shows to what extent do respondents differentially (preferentially) recruit people like themselves. In this study we used HIV status to check for recruitment homophily in each district and the results were greater than 1 meaning more recruits share characteristic with recruiter than expected.

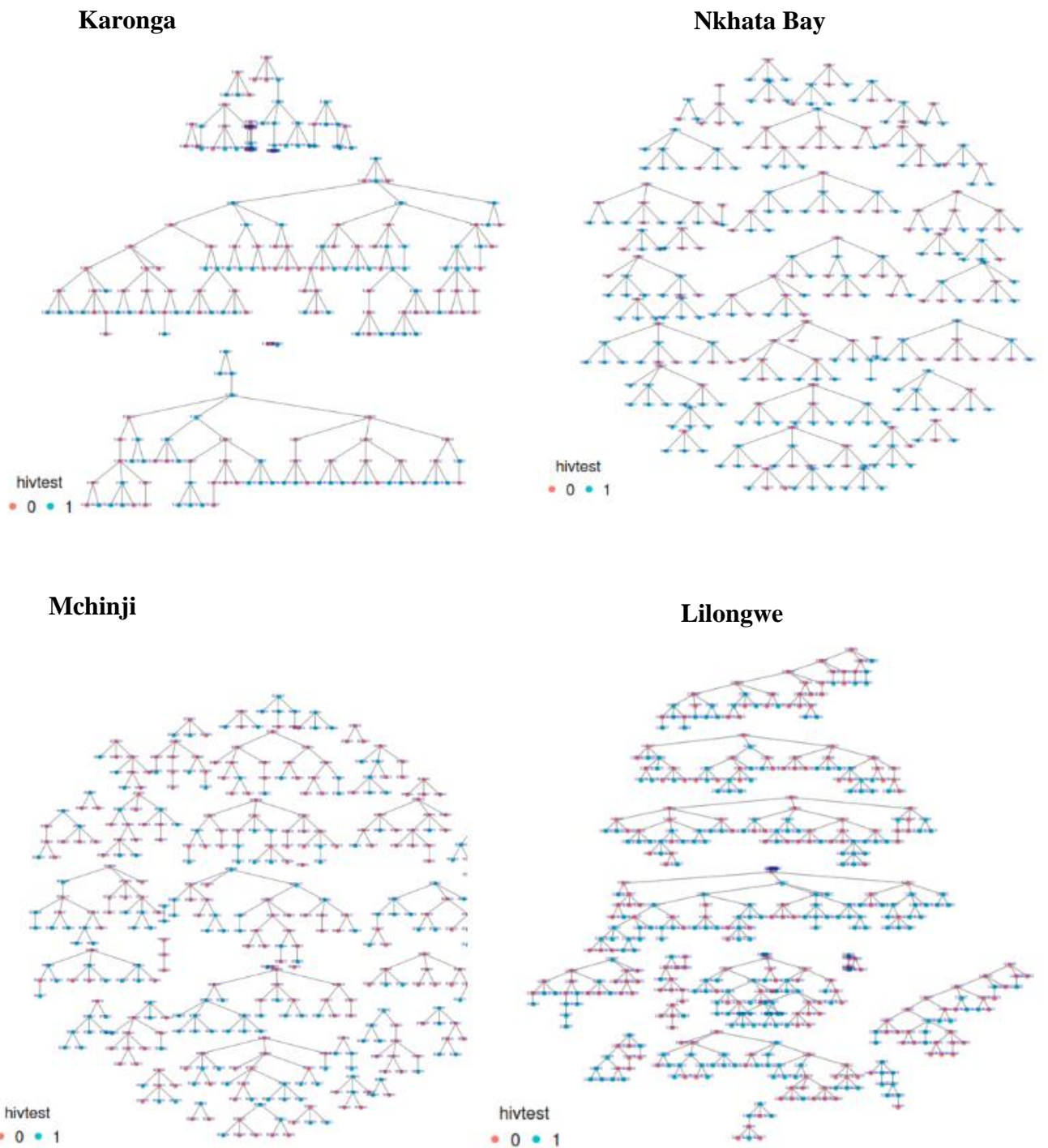
### **6.5.2 Bottleneck plots**

The study used bottleneck plots to identify when recruitment chains are trapped in networks. They also helped to indicate if the population is composed of several disconnected sub-populations.

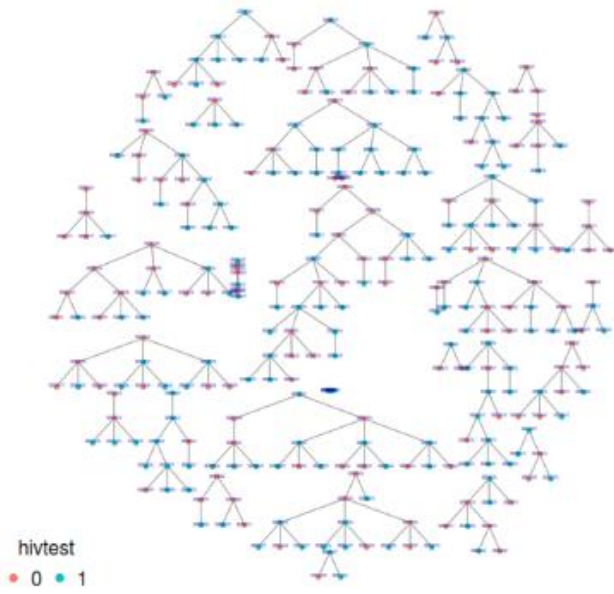
### **6.5.3 Recruitment trees**

Plots were used throughout recruitment to monitor and make changes where necessary. The plots were showing the entire sample recruitment network for each district stratified by HIV status. HIV test result 0 is Tested HIV Positive while 1 is Tested HIV Negative.

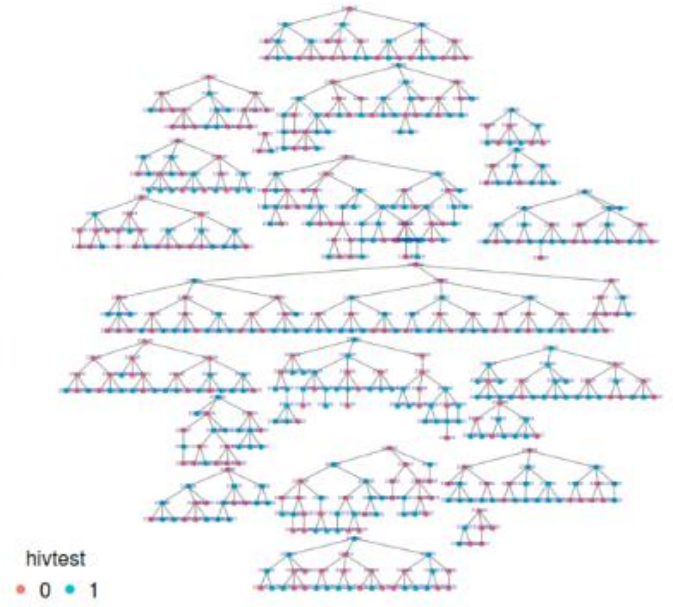
**Figure 47: Female Sex Workers Recruitment Trees**



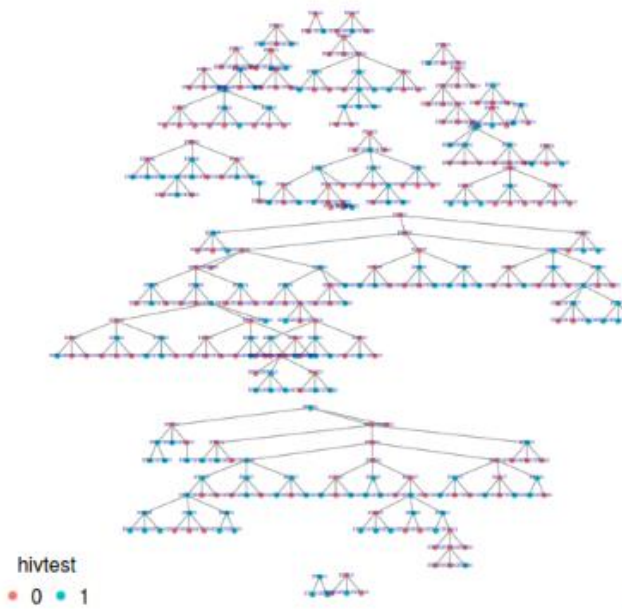
### Mangochi



### Zomba



### Blantyre



### Mwanza

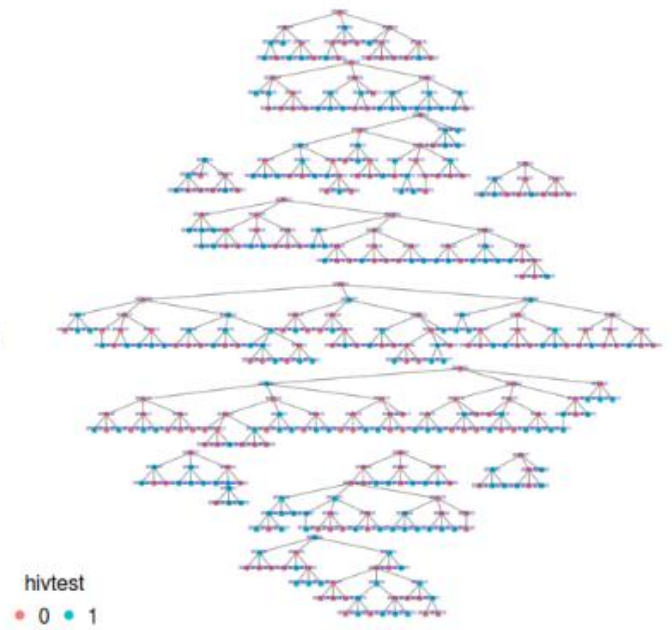
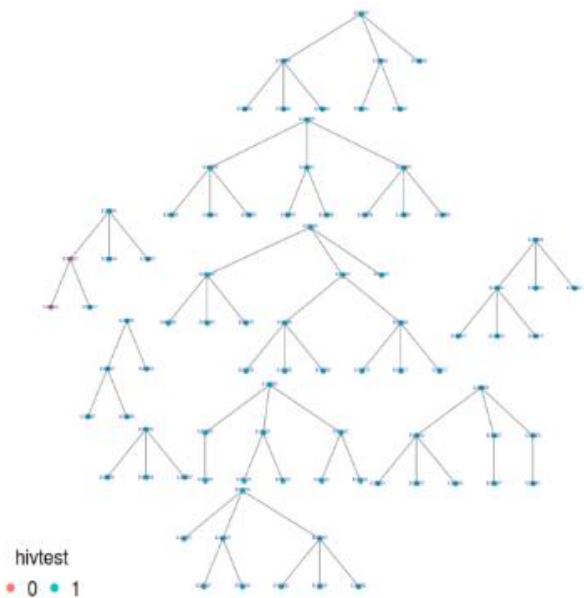
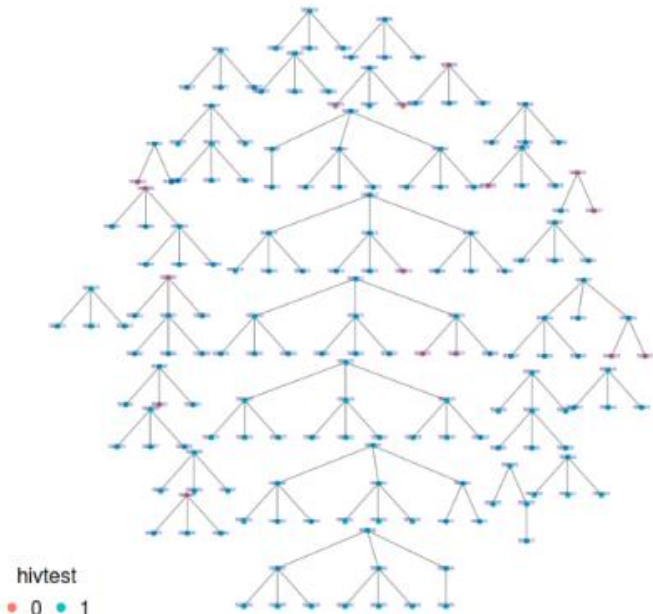


Figure 48: Men Who have Sex with Men Recruitment Trees

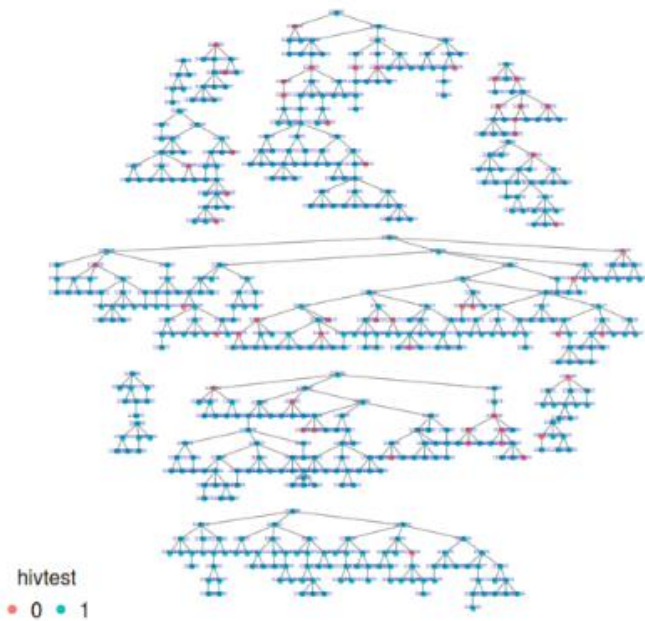
**Karonga**



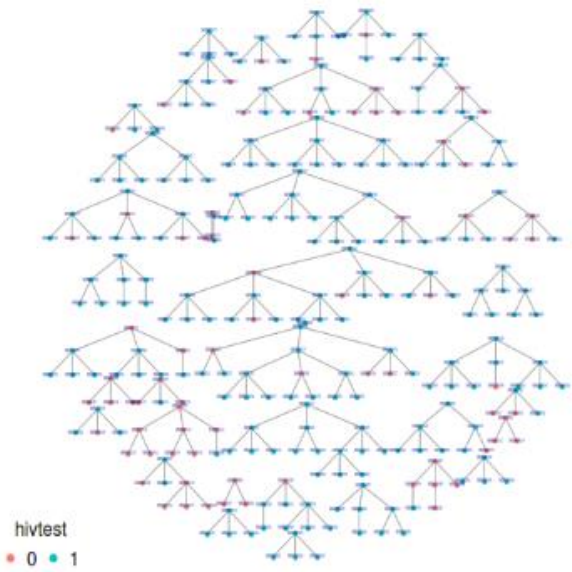
**Nkhata Bay**



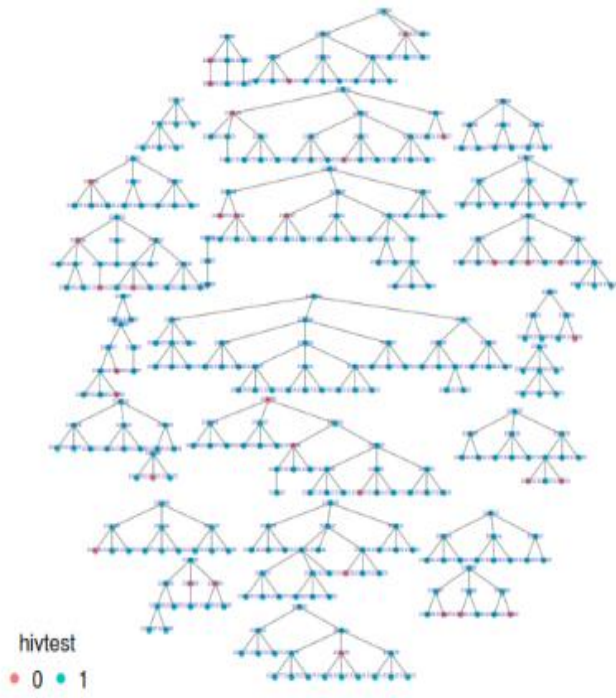
**Lilongwe**



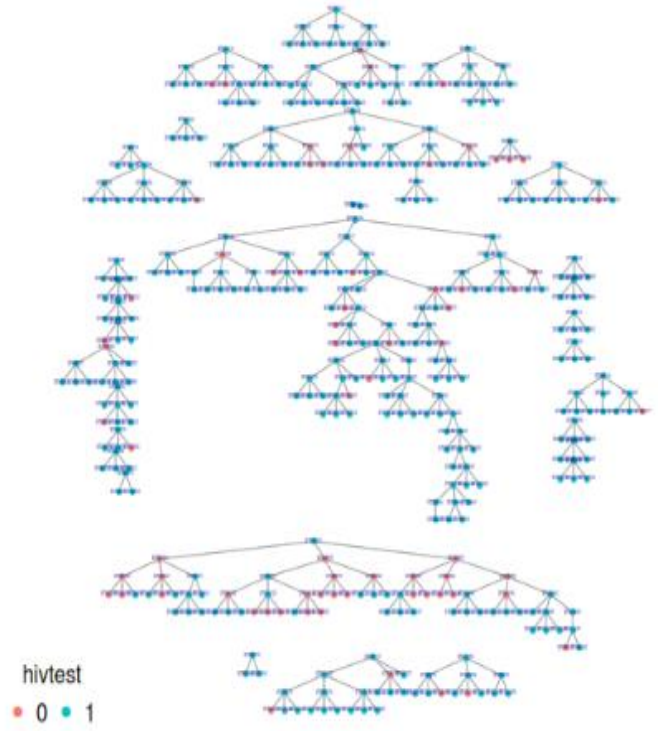
**Mangochi**



## Zomba



## Blantyre



The background features a stylized landscape with green hills and a blue sky. A white rectangular border is overlaid on the image. The text is centered in the lower portion of the white border.

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