Republic of Namibia

Ministry of Health and Social Services

Results of the

Integrated Biological and Behavioral Surveillance Studies among Female Sex Workers in Namibia

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Preface

The Ministry of Health and Social Services (MOHSS) is committed to collecting, interpreting and disseminating health related data through the implementation of routine disease surveillance and special research activities. These data place our country in a better position to track progress towards achieving its health related goals and targets. Collection, interpretation and dissemination of these data also allows us to identify achievements and challenges and to develop appropriate interventions, including those related to the ongoing HIV and AIDS epidemic.

The Namibia Women's Health Study is the one of two of the first integrated biological behavioral study among an HIV epidemic "key population" to be conducted by the MOHSS. Implementing and disseminating the results of the Women's Health Study attests to the commitment of the Ministry for data driven-decision making to improve the quality of health and healthcare for all Namibians. We are confident that the information contained in this report will be useful to people contributing to the health and well-being of our society in many different roles.

The MOHSS is thankful for the political commitment that the Government of Namibia has shown in giving the fight against HIV and AIDS a top priority in all its undertakings. It is this support and commitment that create a favorable environment enabling the Ministry to achieve all its accomplishments in the fight against HIV and AIDS to date. We will be failing in our duty if we don't acknowledge the tremendous contributions made by our partners. The MOHSS appreciates the support of our development and bilateral partners, including the United States Centers for Disease Control and Prevention, the technical assistance of the University of California San Francisco, and the staff and participants who were integral to the success of the Men's Health Study.

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Dr. Berhard Haufiku
Minister of Health and Social Services

1. EXECUTIVE SUMMARY

1.1. Introduction

Intense scale up of Namibia's HIV and AIDS response during the past decade has resulted in a stabilization of the epidemic and substantial reductions in new infections and deaths attributable to AIDS throughout the nation. However, reduced access to HIV prevention, care and treatment services among "key populations", including female sex workers (FSW), may hinder control of the epidemic. Therefore, the Ministry of Health and Social Services (MOHSS) and its partners – including the U.S. Centers for Disease Control and Prevention (CDC) and the University of California, San Francisco (UCSF) – conducted the first integrated bio-behavioral surveillance studies (IBBSS) among FSW in Namibia in the urban arease of Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek. The objectives of the IBBSS were to measure the prevalence of HIV and associated risk factors, assess the uptake of prevention, care and treatment services, and to estimate the size of the FSW population in each of the four urban areas.

1.2. Methods

A formative assessment period gathered key informant and stakeholder input on issues related to HIV among FSW in Namibia and on the logistics of conducting surveys in this population in all four sites. The survey itself was implemented in two phases. Phase one was conducted in Swakopmund/Walvis Bay Windhoek from September, 2012 to August, 2013; phase two was conducted in Katima Mulilo and Oshikango from October, 2013 to June, 2014. A peer-referral method known as respondent driven sampling (RDS) was used to recruit participants. Women who met all of the following criteria were eligible to participate: age 18 years or older; received monetary payment in exchange for sex during the six months preceding the survey; and resided in the study city for at least six months preceding the survey. Participants completed behavioral questionnaires and received rapid HIV testing and counseling (HTC). Participants who tested positive for HIV were referred to care and treatment services. Population size estimates were reached through stakeholder consensus upon reviewing IBBSS data, incorporating community perspectives, and applying the results of several size estimation methods including mapping, unique object multipliers, "wisdom of the crowds," literature reviews, and the Delphi method. Statistical analysis adjusted for the RDS method using RDSAT software.

1.3. Results

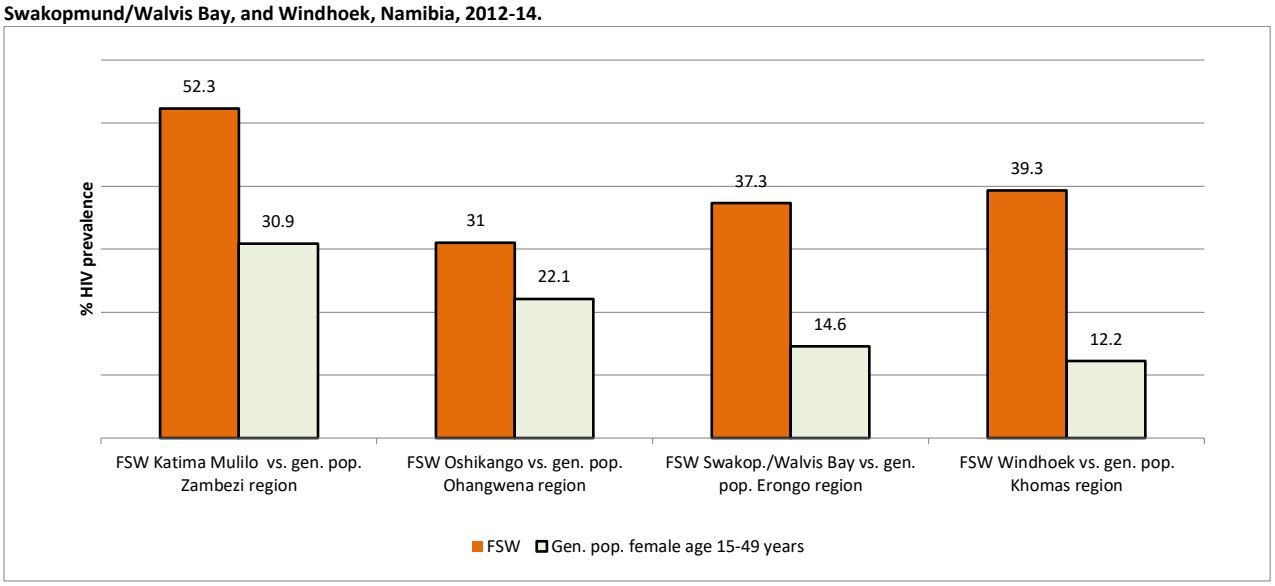
Recruitment and demographic profile of FSW

The Namibia FSW IBBSS successfully recruited 1,188 FSW in the four study sites. The final sample included 309 FSW from Katima Mulilo, 256 from Oshikango, 307 from Swakopmund/Walvis Bay, and 316 from Windhoek **(data shown in section 6.1.2).** The majority of FSW in each site were age 25 years or older and had completed a secondary level of education or higher **(data shown in section 6.2).**

HIV prevalence and associated risk factors

HIV prevalence among FSW was estimated to be 52.3% in Katima Mulilo, 31.0% in Oshikango, 37.3% in Swakopmund/Walvis Bay, and 39.3% in Windhoek **(Figure 1).** The estimated HIV prevalence among FSW in each study site was substantially higher than that of the general population of adult females in the corresponding regions, as measured by the recent Namibia Demographic and Health Survey, 2013 [1].

Figure 1. HIV prevalence among general population adult females by region [†] compared to HIV prevalence among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.



[†] *HIV prevalence estimates as reported by The Namibia Ministry of Health and Social Services (MOHSS) and IFC International. 2014. The Namibia Demographic and Health Survey 2013. Windhoek, Namibia, and Rockville, Maryland, USA: MOHSS and IIFC International.*

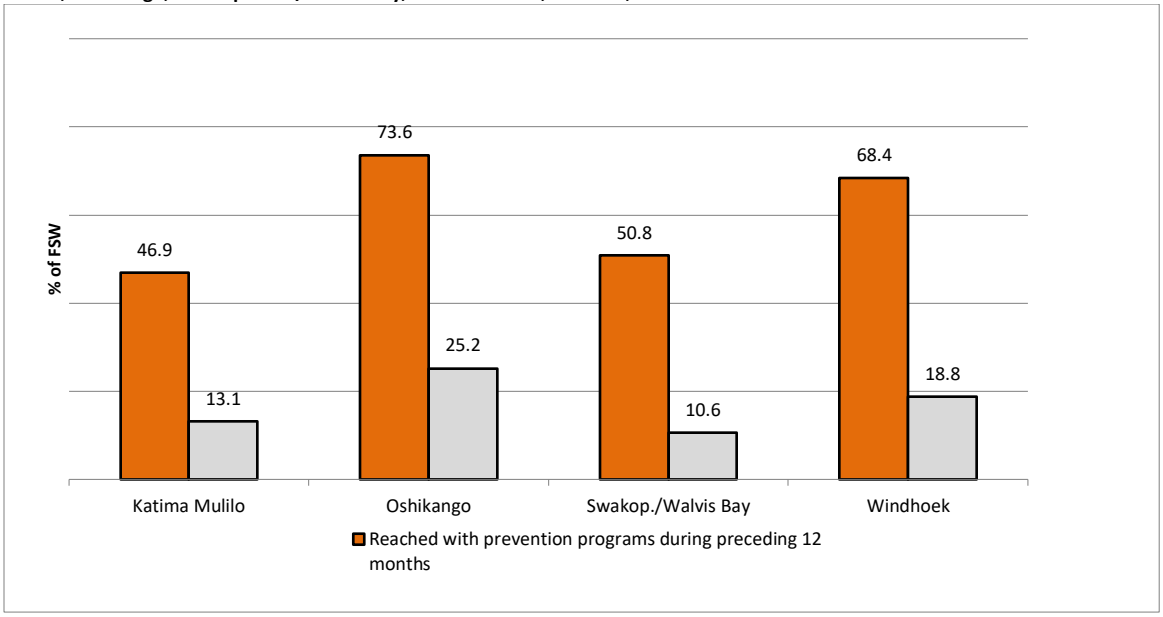
Risk factors associated with HIV infection varied by study site **(data shown in Sec. 6.3).** Among FSW in Katima Mulilo, older age, not being a current student, having more client sex-partners (i.e., sex partners with whom engagement in sexual intercourse is exclusively client in nature), and experiencing physical abuse during the twelve months preceding the IBBSS were associated with increased probability of HIV infection. Among FSW in Oshikango, older age, completing less than secondary education, having more client sex-partners, and having more non-client sex partners (i.e., sex partners with whom engagement in sexual intercourse is not exclusively client in nature, such as a spouse, boyfriend, or casual partner) were associated with increased probability of HIV infection. Among FSW in Swakopmund/Walvis Bay, older age, completing less than secondary education, having more non-client sex partners, and having fewer client sex-partners were associated with increased probability of HIV infection. Among FSW in Windhoek, older age, being unemployed, and never using condoms with non-client sex partners (i.e., boyfriend, husband, casual partner) were associated with increased probability of HIV infection.

Reach of prevention programs, correct and consistent condom use, and uptake of HIV testing and counseling (HTC)

Among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, 46.9%, 73.6% 50.8% and 68.4%, respectively, received an HIV prevention interventions **(Figure 2),** and 13.1%, 25.2%, 10.6%, and 18.8%, respectively, received HIV-related peer outreach during the during twelve months preceding the IBBSS.

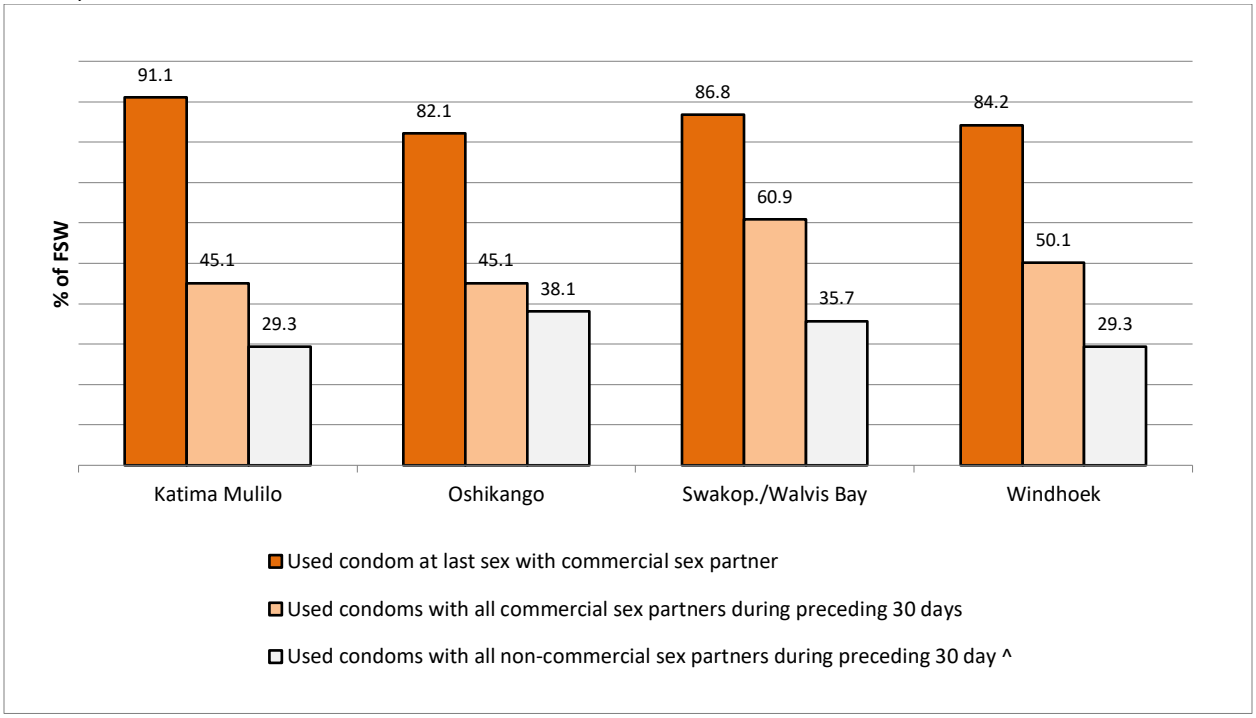
Among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, 91.1%, 82.1%, 86.8%, and 84.2%, respectively, used a condom during the most recent time they had sex with a client sex-partner **(Figure 3)**. Consistent condom use (i.e., 100%) during the 30 days preceding the IBBSS was higher with clients than with non-client partners, also shown in **Figure 3**.

Figure 2. Percentage of FSW who were reached by prevention programs † and peer outreach during twelve months preceding the IBBSS in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.



† *According to the UNAIDS GARPR indicator definition, an FSW was considered to be reached with prevention programs if she answered yes to both of the following questions: 1. Knows where to get a free HIV test; 2. Received free condoms during the during 12 months preceding the IBBSS*

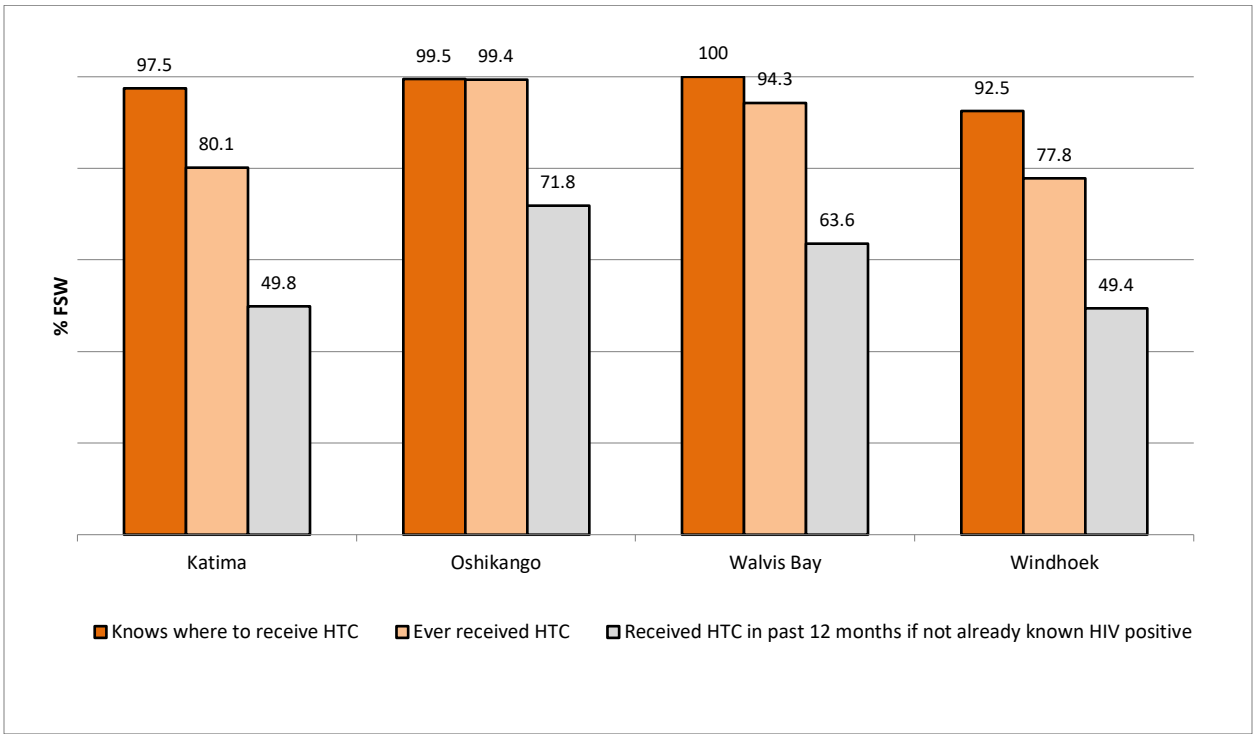
Figure 3. Condom use with client † and non-client ‡ sex partners among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.



† *Calculated only among those FSW who reported having a non-client sex partners during the 30 days preceding the IBBSS. * "Client" refers to a partner with whom engagement in sexual intercourse is exclusively transactional in nature (i.e., monetary payment in exchange for sex).* ‡ *"Non-client" refers to partners with whom engagement in sexual intercourse is not exclusively transactional in nature. A non-client may be a spouse, boyfriend, or casual partner.* ≠ *only includes data from participants who had a non-client sex partner during 30 days preceding IBBSS.*

The vast majority of FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek knew where to receive HTC (97.5%, 99.5%, 100%, 92.5%, respectively), and two-thirds or greater had ever received HTC (80.1%, 99.4%, 94.3%, 77.8%, respectively) **(Figure 4)**. Fewer FSW not previously known to be HIV positive received HTC during the twelve months preceding the IBBSS (64.4%, 82.1%, 71.9%, 56.9%, respectively). Of note, 65.7%, 51.7%, 43.7%, and 48.6% of FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, Windhoek, respectively, sought healthcare for any reason during the twelve months preceding the IBBSS indicating opportunities for provider initiated HTC among FSW within routine healthcare services **(data not shown)**.

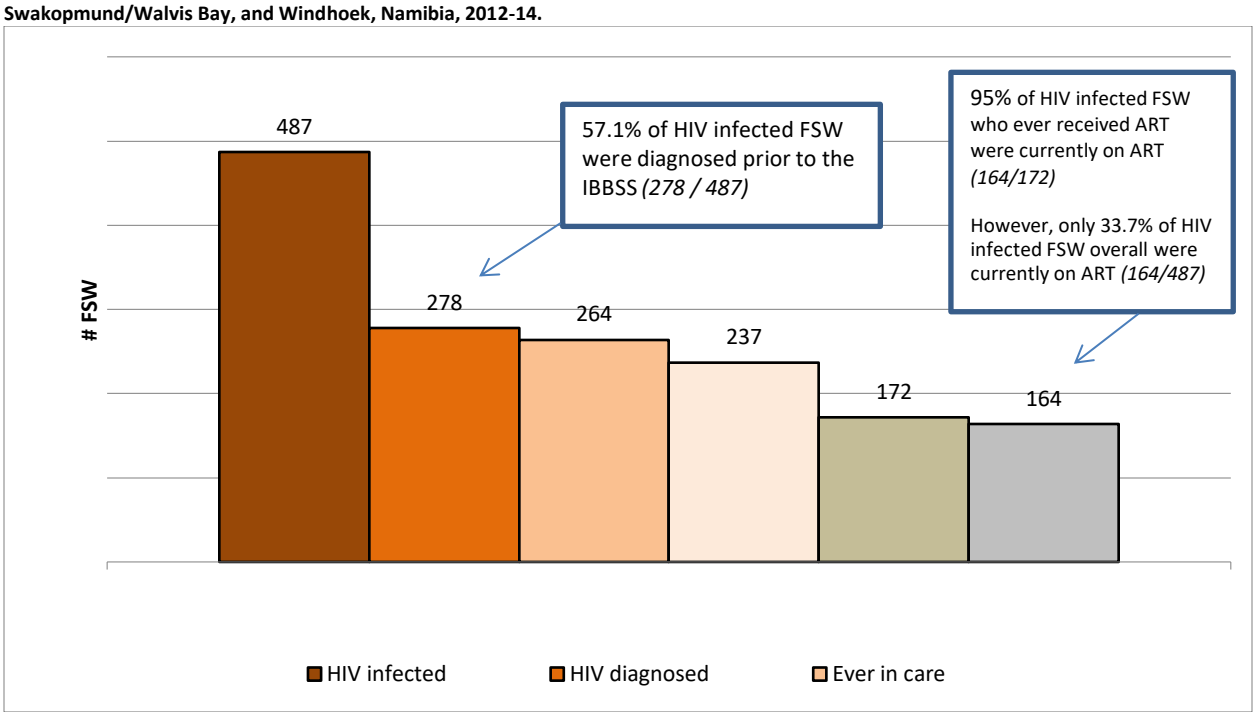
Figure 4. Awareness and use of HIV testing and counseling services among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.



Continuum of engagement in HIV care services among HIV positive FSW

Among the 487 HIV positive FSW who participated in the IBBSS in all four study sites, 278 (57.1%) were aware of their HIV infection (i.e., previously diagnosed), 264 (54.2%) ever received care, 237 (48.7%) were currently in care, 172 (35.3%) ever received ART, and 164 (33.7%) were currently receiving ART **(Figure 5).** With only 33.7% of HIV positive FSW currently on ART, the potential for onward transmission of infection to HIV negative sex partners is high. However, among HIV positive FSW who were aware of their infection, the level of engagement was high; 278/264 (95.0%) FSW who were diagnosed were linked to care; 172/237 (72.6%) FSW who were linked to care were retained in care; and 164/172(95.3%) FSW who ever received ART were currently receiving ART. Levels of engagement at different steps in the continuum of HIV care services varied by IBBSS site **(data shown in section 6.3.1).** The overall proportion of HIV-positive FSW on treatment was low, mostly due to lack of self-awareness of HIV serostatus as the biggest gap in the continuum of HIV services.

Figure 5. Pooled estimates of the continuum of engagement in HIV care services among HIV positive FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.



FSW population size estimates

The number of FSW living in the four sites was estimated using multiple methods. The estimates from each method were reviewed and synthesized in two rounds of stakeholder meetings to arrive at a final consensus and lower and upper acceptable estimates or "bounds". The final stakeholder consensus (and acceptable bounds) of the number of FSW age 15-49 years in Katima Mulilo was 800 (380 - 2,000), in Oshikango 900 (775 - 2,750), in Swakopmund/Walvis Bay 900 (825-1,500), and in Windhoek 3,000 (1,800 -3,400). Due to mobility, these figures may include FSW who permanently or temporarily reside in other areas. The stakeholders further extrapolated estimates to cover all of Namibia by considering other hotspots and possible numbers of FSW present and/or rates that would apply to the adult female population present. The total number of FSW in Namibia was estimated at 8,082 which corresponds to 1.2% of adult women, with a lower acceptable bound of 5,377 (0.8%) and upper acceptable bound of 20,535 (3.0%).

1.4. Conclusions and Recommendations

The IBBSS successfully recruited 1,188 FSW in four cities of Namibia, exceeding the targeted sample size in three out of four surveys. Namibian FSW came from all walks of life, diverse in education, employment, age, marital status, and region of residence. The first round of IBBSS for FSW in Namibia met all its objectives.

The IBBSS estimated HIV prevalence to be 37.5% among FSW in Windhoek, 52.3% in Katima Mulilo, 39.3% in Walvis Bay/Swakopmund, and 31.0% in Oshikango. HIV prevalence among FSW in all study sites is substantially higher than the corresponding regional estimates among general population women as measured by the Namibia Demographic and Health Survey completed in 2013. This indicates that FSW comprise a key population which requires targeted interventions for HIV prevention, care, and treatment. Furthermore, HIV prevalence among FSW – especially older FSW - is alarmingly high in Katima Mulilo and Oshikango. By age 35, nearly three in four (70.6%) FSW in Oshikango were HIV positive and *nearly all* (94.8%) FSW in Katima Mulilo were HIV positive.

Slowing HIV transmission is challenged by the high percentages of FSW with multiple sexual partnerships combined with inconsistent condom use. A high percentage of FSW have multiple concurrent partnerships involving client and non-client sexual networks. Fewer than half of FSW used condoms consistently with client sex-partners and many fewer with non-client sex partners.

Other key service use indicators among FSW in the Namibia IBBSS fall short of recommended targets. Although many FSW have been *"reached by prevention programs"* according to the GARPR definition, the majority have not received HIV-related peer- or community- based outreach, an approach recommended as an effective in accessing key populations and increasing their uptake of prevention services[2]. While many HIV-positive FSW had not yet been diagnosed, the high ART coverage following diagnosis suggests that universal eligibility or "test-and-treat" programs could prevent much onward transmission if the frequency of HTC is increased. Health care use among FSW suggests that provider-initiated testing and counseling strategies may reach a substantial proportion of FSW; enhanced community-based approaches to HTC service delivery are needed to reach others.

Programs that are able to reach FSW with effective prevention interventions stand to avert many new infections among FSW and their client and non-client sex partners. The final stages of "getting to zero" new HIV infections in Namibia may have to prioritize marginalized, stigmatized, and hard-to-reach key populations such as FSW. The results of study highlight the need for a combination of prevention interventions to meet the diverse needs of FSW.

One new intervention with potential for HIV prevention among FSW is preexposure prophylaxis (PrEP). PrEP involves HIV-negative people taking antiretroviral treatment (ART) to help prevent acquiring HIV infection. Several studies have shown PrEP to be safe with minimal side effects and effective in preventing HIV for some populations when taken on a daily basis. PrEP should be combined with condoms and other prevention methods to provide greater protection than when used alone. Given the fact that PrEP is a relatively new prevention tool, awareness and demand in Namibia may be currently low. Therefore, formative research to assess awareness, acceptability, and potential barriers to PrEP use would be required prior to the successful implementation of a PrEP program among FSW.

Based on IBBSS data, the MOHSS and its partners should consider:

- Establishing new and strengthening existing targeted interventions to reach FSW with frequent HTC services, including enhanced community-based approaches. Knowledge of serostatus, linkage to HIV care, and use of ART for suppression of viral load will dampen onward HIV transmission.These interventions should be urgently prioritized in Katima Mulilo where HIV prevalence is exceptionally high.
- Addressing factors associated with HIV infection among FSW – including lack of education or employment, multiple client and non-client sex partnerships, and in the case of Katima Mulilo physical abuse.
- Including FSW in the ongoing development of Namibia's combination prevention strategy and "test-and-treat" interventions.
- Implementing formative research to assess awareness, acceptability, and potential barriers to PrEP use, which could lead to the development of PrEP interventions among this key population.
- Using the population size estimates to set targets for numbers of FSW to be reached by interventions to gauge coverage.

Success in implementing these recommendations and their impact on the HIV epidemic among FSW in Namibia can be measured in future rounds of IBBSS. We point to a final success of our efforts in the transfer of the technology of RDS to Namibia as an effective means to reach and recruit FSW in diverse contexts. As a sampling methodology and a recruitment approach, RDS can be adapted to deliver programs and reach other hidden populations at high risk, such as transgendered persons. Accordingly, we envision that future RDS surveys will play an important role demonstrating Namibia's success in "getting to zero new HIV infections" by showing that FSW have not been left out.

2. LIST OF ACRONYMS

ANC	**Antenatal clinic**
ART	**Antiretroviral therapy**
CDC	**U.S. Centers for Disease Control and Prevention**
FSW	**Female sex workers**
GARPR	**[UNAIDS] Global AIDS Response Progress Reporting**
HIV	**Human immunodeficiency virus**
HTC	**HIV testing and counseling**
IBBSS	**Integrated bio-behavioral surveillance survey**
LGBTI	**Lesbian, gay, bisexual, transsexual and intersex**
LMIC	**Low and middle income country**
MOHSS	**Ministry of Health and Social Services**
PrEP	**Pre-exposure prophylaxis**
RDS	**Respondent-driven sampling**
STI	**Sexually transmitted infection**
UCSF	**University of California, San Francisco**
UNAIDS	**Joint United Nations Programme on HIV/AIDS**
USG	**United States government**

3. INTRODUCTION AND OBJECTIVES

3.1. HIV/AIDS in Namibia

Namibia, with a population of just over 2 million persons sparsely distributed across 824,000 square kilometers, experiences a high, generalized, and mature epidemic. An estimated 14.0% of the adult population (age 15-49 years) is infected with HIV. Differences in HIV prevalence in Namibia can be seen by age, gender, geography, and various risk factors[1]. An estimated 245,351 people in Namibia are living with HIV in 2013 with 9% under the age of 15 and 59% of adults infected being women. An estimated 11,878 new HIV infections occurred during 2013, of which 33% were among youth aged 15-24 years with women accounting for 64% among this age group[3]. High prevalence of HIV infection is related to low levels of HIV risk perception which fosters high-risk sexual behavior such as multiple partners and discourages consistent condom use[4].

Although Namibia has a generalized epidemic, key populations, including female sex workers (FSW), may bear a disproportionate burden of disease. Key populations may also account for relatively larger share of new infections and may transmit to other populations at lower risk. They may therefore be an effective point to prevent the further spread of infection. However, few data are available on key populations in Namibia; few programs are specifically tailored to their prevention and care needs; and they may experience severe stigma and discrimination preventing them from using existing services.

3.2. HIV/AIDS among female sex workers (FSW) in Namibia

Internationally, there has been increased focus on the unmet HIV-related needs of FSW in low and middle income countries. FSW are at increased risk for HIV due to structural, environmental, economic, and individual factors. Further information is needed regarding HIV risk behaviors and prevention needs among this population to ensure they are reached by STI/HIV prevention, care, and treatment services.

Limited data exist about the structure of female sex work in Namibia, but one study describes three categories ("professional", "local", and "low-class") of sex work[5]**.** Professional FSW are the highest paid and engage with clients through appointments mostly made via cell phone. Local FSW may be adolescent girls who left school and operate out of bars and are lower paid. Low-class FSW are the lowest paid and usually meet clients on the street, shebeens or truck stops. Several studies indicate that traditional "pimps", "madams" or brothels do not exist in Namibia[5,6,7].

3.3. Study Justification

Limited data exist in Namibia on the characteristics, population size, HIV prevalence, and health-seeking and HIV risk behaviors of FSW, as detailed in the report of the 2009 Namibia Triangulation Project[8]. The Triangulation Project identified the need for better understanding HIV risk behaviors among FSW to assist in developing and targeting prevention, care, and treatment interventions. Existing studies mainly focus on FSW in Swakopmund (SWA), Walvis Bay (WAL), and Windhoek with limited data for most other parts of the country. The Namibia MOHSS therefore implemented a series of Integrated Biological Behavioral Surveillance Surveys (IBBSS) to measure HIV prevalence, associated risk behaviors, and unmet needs of FSW.

3.4. Study Goal

The goal of the Namibia IBBSS among FSW was to gather data on the burden of HIV disease among FSW and HIV-related risk, preventive, and heath seeking behaviours and to estimate the size of the FSW population in selected urban areas. The IBBSS was designed to provide information that will ultimately be used to develop appropriate prevention, care, and treatment interventions specifically for FSW. Estimation of the FSW population sizes is intended to provide program staff and policy makers information on the scope of the HIV epidemic for program planning, allocating sufficient resources, and monitoring the reach of interventions.

3.5. Study Objectives

The specific objectives of the Namibia IBBSS among FSW were to:

- Estimate the prevalence of HIV and associated risk factors among FSW in Namibia;
- Evaluate the use of and access to health and social programs among FSW, and identify ways to increase their coverage in Namibia;
- Estimate the size of the FSW population in each of four study sites and extrapolate estimates to the national level;
- Strengthen local capacity to conduct biological and behavioral surveys, mapping, and size estimation for FSW and other key populations in Namibia.

3.6. Justification of Study Sites

FSW study sites were chosen based on documentation of the presence of FSW, HIV infection among women, organizations working with FSW, and on recommendations from the recent Triangulation Project[8].

Windhoek, the capital of Namibia, was chosen based on HIV prevalence at antenatal clinics (ANC) over 20% some areas such as in Katutura[9], the presence of organizations working with FSW, and research documenting the presence of FSW[5,6,9,10,11].

The Walvis Bay/Swakopmund area includes one of the busiest shipping ports in southern Africa, with ANC HIV prevalence over 21%[12]. The recent Triangulation Project emphasized the need for more information on mobile populations (i.e., FSW and their clients, such as fisherman, businessmen, etc) in order to better develop intervention programs in this area[8]. The formative assessment of the current study in Walvis Bay found a significant amount of mobility for FSW and clients between Walvis Bay and Swakopmund, which are 30 kilometers apart. Thus, the two cities were combined into one study site.

Oshikango, located near the Angolan border in the Ohangwena region has ANC sentinel HIV prevalence over 22%. The Triangulation Project recommended further research with mobile populations including FSW near this border area[8]. Sex work is common in border areas due to larger numbers of migrant men such as truck drivers and other workers with disposable income. The formative assessment of the current study found that some FSW work in both Oshikango and Oshikati with a number expressing that they would prefer to have the study site in Oshikango. The FSW population in the northern regions were found to be highly mobile; therefore, the study site was located in Oshikango, but allowed participation of FSW from throughout the northern region.

Another northern site, Katima Mulilo, was chosen for FSW due to high HIV prevalence among women and probable high prevalence of sex work. Katima Mulilo, located in the Zambezi Region, has the highest ANC sentinel HIV prevalence (> 31%)[12] and borders 4 other African nations: Zimbabwe, Zambia, Angola, and Botswana.

4. METHODS

A national-level IBBSS Taskforce chaired by the Namibia MOHSS and with representatives from governmental and nongovernmental organizations, development and technical assistance partners, and community members was convened to guide the design and execution of the study. Following consultations among the IBBSS Taskforce, the Namibia IBBSS included two components: a formative assessment and the integrated biological-behavioral surveillance surveys in the four targeted geographic areas.

4.1. Formative assessment

The formative assessment was conducted in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay and Windhoek during a three-week period prior to IBBSS implementation. Data from the formative assessment supported the selection of respondent-driven sampling (RDS) as the most effective sampling and recruitment method, the location of the study sites, the amount of incentives, and the broad topics of the behavioral questionnaire. The assessment used qualitative methods and tools common to ethnographic studies, including key informant interviews, focus group discussions, observation, and mapping. Details on the findings of the formative assessment can be found in Appendix 1.

4.2. Respondent-driven sampling (RDS)

RDS is a peer-referral, social network-based method used in many settings to overcome the problem of achieving representative samples of marginalized or hidden populations such as FSW[13,14,15]. Appropriateness of the RDS methodology depends on meeting theoretical assumptions; namely, the population knows others to be members of the population; the population comprises one large inter-connected set of networks within a few degrees of separation; sampling occurs with replacement; respondents randomly recruit other members of their social network; network size is accurately reported; and that sufficient cross-group recruitment to adjust for differential probability of being included in the sample and for similarities of persons within their social networks. If these assumptions are not met, estimations of population proportions may be biased.

According to theory and protocol, the RDS surveys were initiated with a purposely chosen set of 6-9 initial "seeds" from each of the four study sites who were diverse with regards to age, marital status, employment or student status, income, and having known access to FSW-friendly services. They were known members of the FSW population who were instructed to recruit a limited number of other FSW from their social network, who in turn were enrolled (if found eligible) and instructed to recruit other FSW peers, and so on. In some study sites, additional seeds were added in response to low levels of recruitment from the seeds initially selected. To ensure rapid recruitment, care was taken that seeds were well connected within their networks, well regarded by their peers, sympathetic to the survey's goals, and diverse with respect to the above characteristics. Recruitment progressed until the sample size was met and equilibrium (i.e., when further recruitment did not substantially change the makeup of the sample) was achieved on key variables. In the present surveys, we tracked equilibrium with respect to age, education, student status, marital status, sex with women, sex for money, contact with peer educators, HIV testing, and HIV serostatus.

Coupons were used to refer peers to the study and to link who recruited whom (needed for statistical adjustment) through the use of codes (coupon numbers). RDS Coupon Manager (RDSCM) software version 3.0 and manually using a log book were used to document and analyze the recruitment links. Being in possession of a valid coupon was an eligibility criterion for the survey (see Appendix 2: Recruitment Coupon). The number of recruitment coupons given for each person ranged from three to eleven coupons based on the progress of recruitment at each study site in response to varying degrees of difficulty in attaining the needed sample size. Where weekly recruitment monitoring data showed that certain sub-populations of FSW identified in formative research were underrepresented in the crude sample, members of those sub-populations were issued up to eleven coupons for a period of time to promote recruitment within that social network. As the survey drew to a close and recruitment targets were achieved, the number of coupons issued to participants was systematically reduced to three, to two, to one, and to zero, as is consistent with RDS methodology.

4.3. IBBSS Study Sites and Study Offices

The four urban areas included in the IBBSS, Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, were believed by stakeholders to account for the largest FSW networks in Namibia. It was also believed that these areas had a geographical and cultural diversity and female adult populations large enough to obtain the required sample size. As described above, the surrounding metropolitan areas of each city were also included as part of the survey in order to improve coverage of the target population.

Discrete study offices in each of the four RDS sites above were selected based on their being accessible to the largest numbers and most diverse groups of FSW, near to public transportation, easy to give directions for, easy to locate based on nearby landmarks, not easy to identify by the general public, and not too secluded to be unsafe.

4.4. Eligibility criteria

Women who met all of the following criteria were eligible to participate in the IBBSS:

- At least 18 years of age
- Biologically female
- Able to speak English, Oshiwambo, Silozi, or Afrikaans
- Exchanged vaginal, anal, and/or oral sex for money during the 30 days preceding the IBBSS
- Resident of the study area for at least six months preceding the IBBSS

Additionally, women who had previously participated in the survey (in any of the cities) or who were unable to provide informed consent (including persons under the influence of alcohol or drugs) were excluded. Nationality and citizenship were not criteria for inclusion or exclusion, since foreigners living in Namibia may be part of the FSW population in the study sites.

4.5. Sample size

Sample size estimates were based on the surveillance objective of detecting major changes in the HIV epidemic over between successive IBBS rounds. In this survey, each site was considered a separate survey with the estimated sample size required to follow changes in each location. The target sample size was set at 300 FSW per site. The estimation is based on the following formula and assumptions:

$$n = D[Z1\text{-}\alpha\sqrt{2P(1\text{-}P)} + Z1\text{-}\beta\sqrt{P1(1\text{-}P1) + P2(1\text{-}P2)}]^2 / (P2\text{-}P1)^2$$

Where:

D = design effect of 2.0.

P1 = the estimated proportion of the key variable or behavior at the time of the first survey. For the purposes of estimation, we used condom used at last sex with a client at 70%.

P2 = the estimated proportion of the behavior at the next round of IBBS, so that (P2 - P1) is the magnitude of change we wish to be able to detect. In this case, we would like to be able to detect a 15% increase (to 85%) based on the ability to assess meaningful program effort between surveys.

$P = (P1 + P2)/2$;

$Z1\text{-}\alpha$ = the z-score corresponding to desired level of significance (we used 95% significance level and corresponding two-sided z-score);

$Z1\text{-}\beta$ = the z-score corresponding to the desired level of power (we used 80% power and corresponding two-sided z-score)

The above parameters for a 15% change in condom use at last sex between survey waves produce needed sample sizes of 268 FSW per site per survey year. To allow for missing data, the sample size goal was set for 300 in each study site.

4.6. Informed consent

Participants gave verbal informed consent prior to enrollment in the survey. Eligible recruits read or had read to them the verbal informed consent information sheet in English, Oshiwambo, Lozi, or Afrikaans with the opportunity to have any questions answered by the interviewer. Participants were not required to sign the consent forms because their signature would be the only link between the individual and the study. Consent allowed for separate agreement to the different components of the study, such as completion of the questionnaire and HIV rapid testing.

4.7. Behavioral data collection

Behavioral data were collected using a standardized questionnaire based on similar surveys implemented among FSW in other countries, and adapted to the Namibia FSW context. The questionnaire included questions to inform national programs, to measure international indicators related to the response to the HIV epidemic (e.g., UNAIDS Global Indicators), and to allow for the specialized analysis of RDS data. The topics included demographic data, behaviors potentially related to HIV infection and other STIs, discrimination, access and use of HIV prevention, care, treatment, and other health services. Each participant answered questions about the size of their FSW social network. The personal social network size was used to calculate weights that adjust point estimates and 95% confidence intervals to be representative of the underlying population. The full survey questionnaire can be found in Appendix 3: Questionnaire.

The questionnaire was developed in English. The questionnaire was tested and reviewed by study investigators and study staff during formative assessment and training for survey implementation. Namibian study staff fluent in local languages administered the behavioral questionnaires to participants in Oshiwambo, Silozi, or Afrikaans when necessary. The IBBSS questionnaire was designed electronically using the Questionnaire Development System (QDS™) software, version 2.6.1, and administered by interviewers using a notebook computer.

4.8. Laboratory procedures

Serological testing for markers of HIV used Namibia MOHSS-approved assays following a parallel algorithm based on the national protocol for HIV rapid testing. Testing occurred after consent including for testing, the questionnaire, and pre-test counseling. HIV rapid testing was conducted at the study sites by certified study staff. Persons testing positive for HIV were referred to care services with further counseling and testing. HIV testing procedures were supervised by study site coordinators, who were certified nurses also certified in rapid testing and quality control. Waste disposal standards were adhered to for biological testing procedures. Laboratory staff was trained to ensure proper disposal practices.

Quality Assurance of the HIV rapid testing was conducted by the Namibia Institute of Pathology (NIP). IBBSS testing procedures fell under external quality assurance (EQA) procedures for MOHSS rapid testing which use proficiency testing. In brief, EQA procedures required venous blood collection and re-testing of every 20th IBBSS participant sample at the NIP laboratory using a fourth generation enzyme linked immunosorbent assay (ELISA).

4.9. Procedures for population size estimation

No gold standard for the true size of the FSW population currently exists. Therefore, the number of FSW in each area was estimated using five different methods. These methods included: 1) key informant estimates, 2) census mapping with enumeration, 3) literature review, 4) unique object multiplier, and 5) “wisdom of the crowds”. After the completion of the IBBSS, a stakeholders meeting was held and a modified Delphi approach was used to synthesize the estimates from the five methods and to incorporate the local knowledge of the stakeholders. A description of each method is provided below.

Key informant size estimation method

The key informant method gathers information from persons who have unique information concerning the population size of FSW. The key informants may include informed stakeholders, such as service providers, community activists, and venue

gatekeepers. In the approach, the key informants are asked to estimate or guess the number of FSW in the city. We used the median response , the 25th, and 75th percentiles as the point estimate, lower acceptable bound, and upper acceptable bound, respectively. This methods was implemented in the formative phase.

Census mapping and enumeration method

The census mapping and enumeration method was also conducted as part of the formative assessment stage. The method estimated the population size of FSW by first mapping the venues or 'hotspots' where FSW congregate and find clients based on key informant reports. The research field team went to each venue and counted the number of FSW present. This 'head count' was summed across all venues or hotspots mapped in the particular geographic areas to obtain an estimate of the total population size. Because this method depends on the visibility of FSW, these estimates are likely an undercount of the true population size.

Literature review size estimation method

In the literature review method, published articles and reports were reviewed for size estimation exercises performed in similar populations and geographic/cultural settings to the study area (i.e., sub-Saharan Africa). The proportion of adult females estimated to be FSW in these other studies was then applied to the adult female population in the Namibian study locations obtained from the census.

Unique-object multiplier size estimation method

The unique-object multiplier[16] estimates the population size using two samples of the target population. The first sample, the "benchmark", is composed of members of the target population who have experienced a particular event. The second is a representative sample of the target population. The proportion of the second sample who is included in the first sample is referred to as the "multiplier". The benchmark is divided by the multiplier to obtain the population size. For the current surveys, the benchmark count was flashlights/torches distributed by community partners across the mapping immediately prior to the start of the RDS survey. The second sample was the RDS survey itself. The number of torches distributed was divided by the proportion of FSW who reported having been given a torch in the RDS survey to produce the population size estimate.

Wisdom of the crowd size estimation method

The wisdom of the crowd[17] size estimation method is based on the theoretical assumption that the collective knowledge of a population will, on average, settle on the true value of a variable. Participants in the Namibia IBBSS were asked in the survey how many other FSW they believed lived in the study area. The median of all responses was taken as the point estimate, with the 25th and 75th percentiles as the lower and upper acceptability bounds, respectively.

Modified Delphi size estimation method

After all other size estimation methods were completed, the modified Delphi method[16] was performed, in which a panel of stakeholders, composed of service providers, non-governmental organizations, community groups, and individual community members convened to form a final consensus of the population size. First, each member of the panel provided their best guess of the population size in each of the four study sites. The IBBSS research team then provided the panel with the estimates from the other population size estimation methods, along with the limitations of each method. Each panel member was then given the opportunity to "update" their first estimate, now informed by the research results. The median of the second round of estimates was taken as the approximate population size for each site. The stakeholder panel also guided the extrapolation to produce FSW population size estimates for all of Namibia and other non-IBBSS geographic areas within Namibia **(more details on the modified Delphi approach and extrapolation is provided in Section 6.4.1 and 6.4.2).**

4.10. Pre-survey implementation training

Before implementation, IBBSS field staff received a two-week training, which focused on general knowledge of FSW in the world and in sub-Saharan Africa, ethical issues in human subject research, and standard operating procedures for the RDS survey implementation. The training included theory as well as practical exercises simulating survey procedures facilitated by study investigators. Training included all team members from the four study locations, including the supervisor, coupon manager, receptionist, interviewers, counselors, nurses, and community liaison officers. Staff were trained and certified in HIV testing and counseling by the MOHSS prior to IBBSS implementation. Study staff were centrally supervised by the study investigators.

4.11. Data entry and management

Data from behavioral questionnaire interviews were entered directly by the interviewer on a laptop computer using QDS™ software. The results of on-site HIV rapid tests were also entered into the same participant QDS file at the time the results became available. Coupon distribution data were entered by the coupon manager using RDSCM software. The supervisor copied all QDS™ and RDSCM and EpiData files from the individual laptops onto an on-site password protected computer and e-mailed the encrypted files to the project Data Manager in Windhoek each day. Paper files were kept in a locked filing cabinet at the study offices before being transferred to the national IBBSS office.

4.12. Data analysis

Data from each of the four study sites were merged into a single database and cleaned using Stata version 12.1 SE (Statacorp LP, 1985-2011) and exported into RDSAT V 7.1.38 (Cornell University, 2011). RDSAT (using the RDS-II estimator described by Volz and Heckathorn, 2008)[18] was used to produce point estimates and 95% confidence intervals of the of demographic and risk behavior variables and HIV prevalence by study site. In RDSAT, the number of re-samples for bootstrap was set to 150,000 and the algorithm type as "enhanced data-smoothing." RDS network size of each participant was determined by the following question: *"Approximately how many other FSW older than 18 years do you know who live in this city and that you have seen in the past 30 days?"*. RDSAT-produced survey weights were exported to Stata for analysis using generalized linear models to determine individual associations between HIV infection and candidate demographic and risk behavior variables. Candidate variables were selected for inclusion in the bivariate models if they were assumed to have potential utility for establishing a risk-profile that could be used by the MOHSS and its partners to develop targeted interventions for primary prevention and/or identification of existing infections. Bivariate tests for association between variables were considered statistically significant when the resulting *P* values were ≤ 0.05 (significant) or ≤ 0.10 (borderline significant). Multivariable logistic regression analysis was performed to assess risk-profile predictors of HIV infection while controlling for potential confounding variables. Risk-profile variables were considered for inclusion in the full multivariable models if tests for statistical significance of bivariate associations produced a *P* value ≤ 0.2. Adjusted odds ratios, 95% confidence intervals and P values were calculated. Variables that were significantly ($P \leq 0.05$) or borderline significantly ($P \leq 0.1$) associated with HIV infection in the full multivariable were retained in the final multivariable model. Recruitment network figures were created using Graphviiz software package.

5. ETHICAL CONSIDERATIONS

5.1. Ethical review of the survey protocol

The survey was reviewed and approved by the Research Committee of the Directorate for Policy, Planning, and Human Resources of the MOHSS in Windhoek, Namibia, and the Committee on Human Research (CHR) at the University of California, San Francisco (UCSF) in the USA. The protocol was also reviewed by the CDC office in Namibia and at the CDC Center for Global Health in Atlanta, USA. Data collection staff completed training on human subjects research and signed a confidentiality agreement before commencing their survey duties.

5.2. Participant confidentiality

Participation in the survey required verbal informed consent. In order to protect their identity, the participants were not asked to provide any identification. Participant anonymity and data confidentiality were protected in the collection, transmission, and processing of data by using unique numeric and alpha-numeric codes that were not derived from any personal identifying information. In addition, access to data was limited to study investigators and staff with data management or analysis responsibilities.

5.3. Participant incentives

Participants were reimbursed N$100 for transportation costs and were given a non-monetary primary incentive package valued at NAM$80/US$10.35 and consisting of a non-perishable snack and juice, condoms, lubricant, and small size make-up kit for completing the study. In addition, participants were provided with a N$20 mobile phone network voucher as secondary incentive for each successful recruit. The amount of reimbursement for transportation and the total cash value for both primary and secondary incentives were modest enough not to encourage the participation of persons outside the target population.

5.4. Participant referrals

Participants who gave informed consent for rapid HIV testing were provided with pre- and post- test counseling by certified counselors. Participants with positive results were referred to local health facilities where HIV care and treatment services were freely available. Staff at these facilities received sensitization training about the survey population. Recruits who screened for participation but were ineligible were referred to HIV counseling and testing services available at MOHSS clinics or thorough non-governmental providers in the community. Additionally, ineligible non-enrolled persons were referred to psycho-social support services as necessary. Persons under the age of 18 years who self-reported or were suspected to be involved in sex work during the eligibility screening were referred to the appropriate public or non-governmental service provider for psycho-social support. Service providers who provided psycho-social support, including legal assistance, appropriate to minors involved in sex work were identified by the investigators in each of the study sites. Standardized, anonymouse bidirectional referral forms of the MOHSS were used for the purpose of tracking referral completion.

6. RESULTS

6.1 Recruitment and Refusals

6.1.1. Recruitment

IBBSS recruitment was conducted from September 2012 to August 2013 in Swakopmund/Walvis Bay and Windhoek (47 weeks) and from October 2013 to June 2014 in Katima Mulilo and Oshikango (39 weeks).

Nine seeds were identified in the Katima Mulilo site, one of whom was ineligible to participate in the IBBSS. Each of the remaining eight seeds contributed to the recruitment of participants, three of whom contributed to the recruitment of 156 participants (50.5% of the total). The maximum number of recruitment waves in Katima Mulilo was eleven

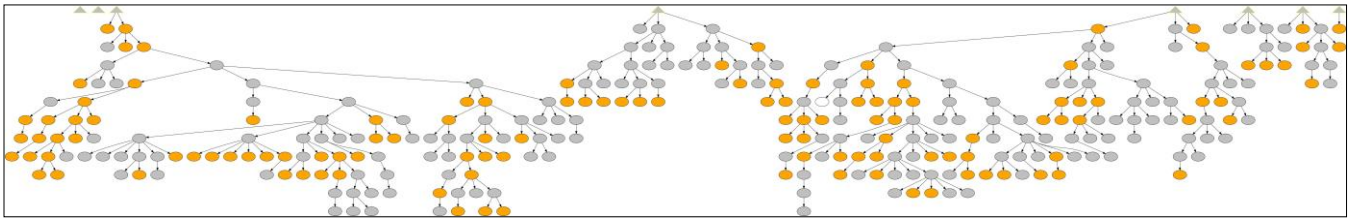
Nine seeds were identified in the Oshikango site, three of whom were ineligible to participate in the IBBSS. Four of the six remaining seeds contributed to the recruitment of participants. One seed contributed to the recruitment of more than 75% of the total number of participants. That seed grew a recruitment chain to 15 waves while the other three seeds did not grow beyond three waves.

Initially five seeds were identified in the Swakopmund/Walvis Bay site, all of whom were eligible to participate in the IBBSS. Only one of these seeds managed to recruit through multiple (nine) waves while the other four terminated after only two waves of recruitment. Due to the initially slow pace of recruitment an additional 14 seeds were planted during the remaining weeks of recruitment. Four of the 19 seeds contribute more than a third of the total number of recruits. The maximum number of recruitment waves in Swakopmund/Walvis Bay was nine.

Ten seeds were initially identified in the Windhoek site, all of whom were eligible to participate. Due to the slow pace of recruitment, nine additional seeds were added. Of the 19 seeds, one contributed to more than 50% of recruitment. The maximum number of recruitment waves in Windhoek was eight.

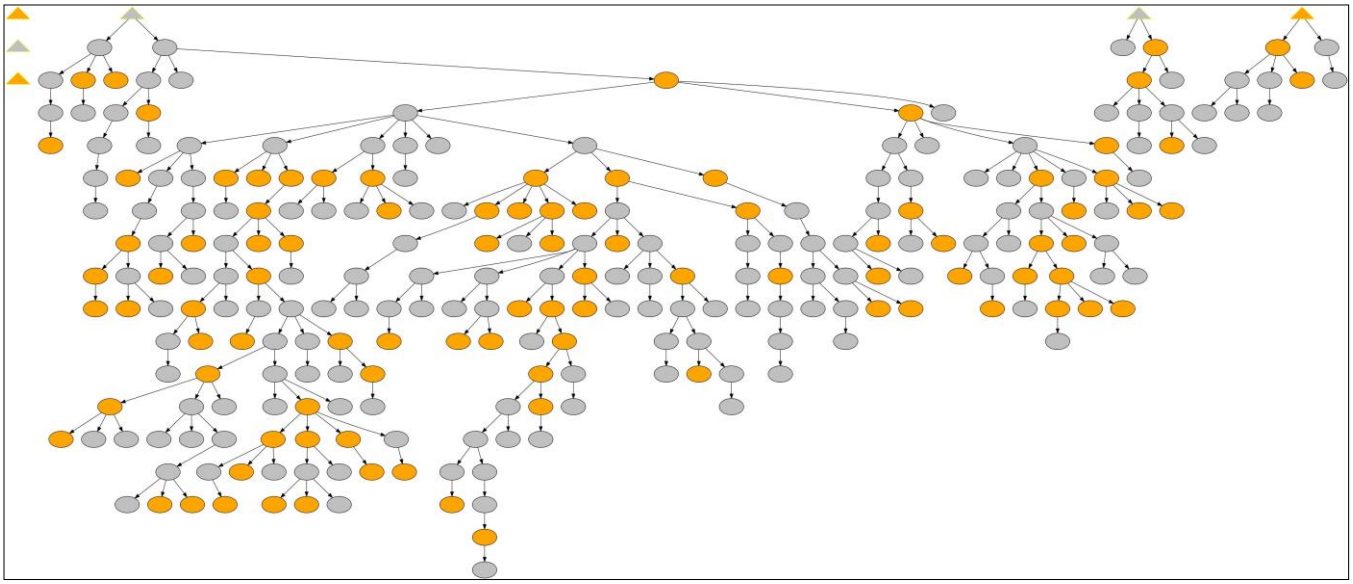
Figures 6-9 illustrate the recruitment chains in the four study sites. Seeds are represented by triangles with black arrows that point outwards to recruits. Recruits are represented by circles. Orange coloring indicates that the participant (whether seed or recruit) was age 18-24 years and grey coloring indicates that the participant (whether seed or recruit) was age $\geq$ 25 years. Seeds who failed to recruit any participants do not have attached arrows and are positioned on the extreme top or left edge of the diagrams. As can be seen in the diagrams, the age of participants in each site diversified throughout the recruitment process and that equilibrium was achieved on this key demographic variable (i.e., participants 25 years old and older recruited not only participants in the same age group but also those 18–24 years old and vice versa). This demonstrates that the sample conformed to RDS theory in that recruitment chains can reach diverse sub-groups despite the fact that the seeds were not selected at random. Therefore, RDS-adjusted analysis of data collected from these study sites was appropriate.

Figure 6. Diagram of IBBSS participant recruitment, Katima Mulilo site, Namibia, 2014.



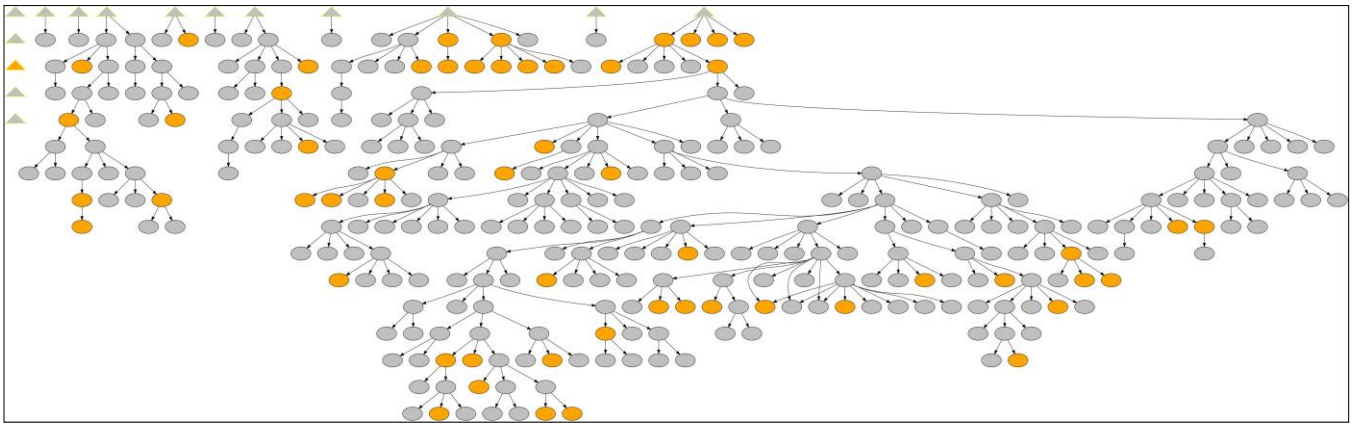
Seeds are represented by triangles with black arrows that point outwards to recruits. Circles represent recruits. Orange coloring indicates that the participant (whether seed or recruit) was age 15-24 years and grey coloring indicates that the participant was age > 25 years. Seeds who failed to recruit any participants do not have attached arrows and are positioned on the extreme left or top edge of the diagrams.

Figure 7. Diagram of IBBSS participant recruitment, Oshikango site, Namibia, 2014.



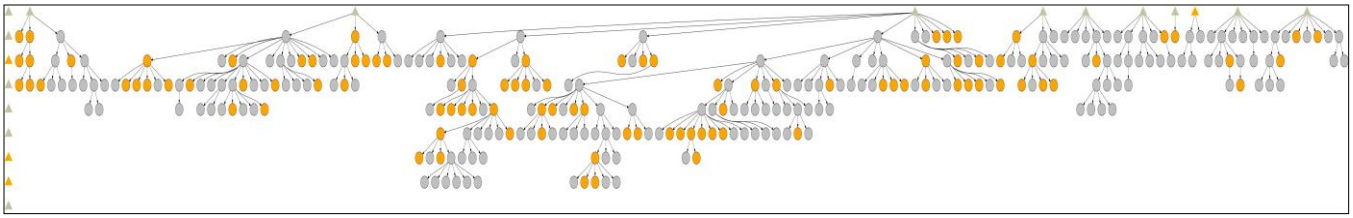
Seeds are represented by triangles with black arrows that point outwards to recruits. Circles represent recruits. Orange coloring indicates that the participant (whether seed or recruit) was age 15-24 years and grey coloring indicates that the participant was age > 25 years. Seeds who failed to recruit any participants do not have attached arrows and are positioned on the extreme left or top edge of the diagrams.

Figure 8. Diagram of IBBSS participant recruitment, Swakopmund/Walvis Bay site, Namibia, 2014.



Seeds are represented by triangles with black arrows that point outwards to recruits. Circles represent recruits. Orange coloring indicates that the participant (whether seed or recruit) was age 15-24 years and grey coloring indicates that the participant was age > 25 years. Seeds who failed to recruit any participants do not have attached arrows and are positioned on the extreme left or top edge of the diagrams.

Figure 9. Diagram of IBBSS participant recruitment, Windhoek site, Namibia, 2014.



Seeds are represented by triangles with black arrows that point outwards to recruits. Circles represent recruits. Orange coloring indicates that the participant (whether seed or recruit) was age 15-24 years and grey coloring indicates that the participant was age > 25 years. Seeds who failed to recruit any participants do not have attached arrows and are positioned on the extreme left or top edge of the diagrams.

6.1.2. Summary of eligibility and survey enrollment

A total of 887, 680, 1,586 and 1271 coupons were distributed in the Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek study sites, respectively. Of the coupons distributed, 426 (48.0 %), 330 (48.5 %), 396 (25.0 %), and 366 (28.8 %) were returned by potential participants to the study sites in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, respectively. The eligibility rate (i.e., number participants screened eligible / the number of coupons returned by potential participants) was 72.5%, 77.6 %, 77.5 %, and 86.3 % in the Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek study sites, respectively.

The most common reason for ineligibility in each of the four study sites was *not exchanging sex for money during the 30 days preceding the IBBSS preceding the IBBSS.* Other common reasons for being ineligible were: *being under the age of 18*, *being intoxicated at the time of eligibility screening*, *having participated in the study before,* and *not having resided in the study area during the six months preceding the IBBSS*.

The final sample sizes were 309 in Katima Mulilo, 256 in Oshikango, 307 in Swakopmund/Walvis Bay, and 316 in Windhoek.

6.1.3. HIV rapid testing refusal

HIV rapid testing was not performed on one, seven, three, and five FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, Windhoek, respectively, because they did not consent to that component of the study. The main reasons given for refusing testing were; fear of knowing serostatus or prior knowledge of serostatus through recent HIV testing.

6.2. Description of the study population

Results in this section **(6.2)** describe FSW in the four study sites according to select demographic characteristics and HIV risk behaviors. The crude or study sample number is presented in the # column;RDS adjusted proportions and 95% confidence intervals are presented in the columns to the right for each site.

Demographic characteristics of FSW

Table 6.2.1 describes the age, marital status, and religious affiliation of FSW in the four study sites. The majority of FSW in the four study sites were age < 35 years. In Katima Mulilo, 46.7% of FSW were between the ages of 18-24 years. In both Oshikango and Swakopmund/Walvis Bay, the majority of FSW were age 25-34 years (56.8% and 59.1%, respectively). FSW in Windhoek were approximately evenly distributed across age categories. Most FSW in each of the four study sites had never been married (78.0% in Katima Mulilo, 90.1% in Oshikango, 90.9% in Swakopmund/Walvis Bay, 90.1% in Windhoek). More than 90% of FSW in each site affiliated with the Christian religion.

In all study sites, the majority of FSW completed secondary education (69.4% in Katima Mulilo, 77.7% in Oshikango, 84.9% in Swakopmund/Walvis Bay, 60.3% in Windhoek). More than 90% of FSW in each study site were not currently a student.

More than two-thirds of the FSW in each site were unemployed at the time of the IBBSS (85.5% in Katima Mulilo, 82.8% in Oshikango, 77.2% in Swakopmund/Walvis Bay, 67.0% in Windhoek).

Table 6.2.1: Age, marital status and religious affiliation among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.

	Katima Mulilo		Oshikango		Swakop./Walvis Bay		Windhoek	
Variable	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)
Age group								
18 - 24 years	123	46.7 (37.7 - 54.2)	98	34.7 (26.5 - 43.8)	57	22.5 (15.3 - 30.8)	103	34.2 (26.9 - 43.8)
25 - 34 years	137	37.8 (29.8 - 46.4)	137	56.8 (47.7 - 65.2)	191	59.1 (51.0 - 66.5)	120	39.3 (30.2 - 46.8)
≥ 35 years	48	15.5 (10.3 - 22.5)	21	8.5 (4.1 - 13.8)	59	18.4 (12.9 - 24.5)	93	26.5 (19.2 - 34.3)
Marital status								
Currently or previously married	59	21.2 (15.4 - 27.7)	20	9.9 (4.9 - 16.1)	29	9.1 (5.4 - 13.7)	40	9.9 (6.3 - 14.6)
Never married	250	78.8 (72.3 - 84.6)	236	90.1 (83.8 - 95.1)	278	90.9 (86.4 - 94.6)	276	90.1 (85.5 - 93.7)
Religious affiliation								
Christian	294	94.7 (91.4 - 97.4)	255	100 (99.9 - 100)	300	98.6 (97.2 - 99.6)	293	93.3 (88.6 - 96.9)
Other or none	15	5.3 (2.6 - 8.6)	1	0.0 (0.0 - 0.1)	7	1.4 (0.3 - 2.7)	23	6.7 (3.2 - 11.4)

Table 6.2.2. describes the level of education, employment, and recent mobility among FSW. The majority of FSW in each study site completed a secondary level education (69.4% in Katima Mulilo, 77.7% in Oshikango, 84.9% in Swakopmund/Walvis Bay, 60.3% in Windhoek) or greater. Fewer than 10% of FSW in each study site were currently students. More than two-thirds of the FSW in each site were unemployed during the twelve months preceding the IBBSS (85.5% in Katima Mulilo, 82.8% in Oshikango, 77.2% in Swakopmund/Walvis Bay, 67.0% in Windhoek).

Table 6.2.2: Education and employment among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.

	Katima Mulilo		Oshikango		Swakop./Walvis Bay		Windhoek	
Variable	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)
Completed secondary level of education or greater	219	69.4 (61 - 77.3)	196	77.7 (69.8 - 85.7)	252	84.9 (79.6 - 89.9)	198	60.3 (52.4 – 68.8)
Currently a student	30	9.4 (5.9 - 13.7)	7	2.7 (0.2 - 7.2)	24	8.1 (4.4 - 12.4)	5	1.6 (0.0 - 2.2)
Employed at any time during 12 months preceding the IBBSS	42	14.5 (9.8 - 19.8)	36	17.2 (10.8 - 24.5)	62	22.8 (15.5 - 31.0)	120	33.0 (26.1 - 40.5)

Sexual history and recent sexual behaviour among FSW

The majority of FSW were between the ages of 15 and 19 years at the time of their sexual debut (74.7% in Katima Mulilo, 82% in Oshikango, 70.7% in Swakopmund/Walvis Bay, 72.3% in Windhoek) **(Table 6.2.3).** Most FSW in Katima Mulilo, Oshikango and Windhoek first exchanged sex for money between the ages of 15 and 19 years. In Swakopmund/Walvis Bay, the majority of FSW (77.1%) first exchanged sex for money at a later age, beginning at age 20 years or older. Fewer than half of FSW in each site ever had anal sex.

Table 6.2.3. Sexual history among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.

	Katima Mulilo		Oshikango		Swakop,/Walvis Bay		Windhoek	
Variable	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)
Age of sexual debut								
< 15 years	64	21.9 (15.8 - 28.3)	28	6.5 (2.8 - 10.6)	30	10.3 (6.2 - 15.0)	61	18.1 (11.7 - 24.6)
15 - 19 years	231	74.7 (68 - 81.1)	199	82.1 (73.9 - 89)	219	70.7 (63.6 - 77.2)	225	72.3 (65.3 - 80.1)
≥ 20 years	13	3.4 (1.4 - 5.9)	29	11.4 (5.8 - 19.3)	54	19.0 (13.2 - 25.3)	30	9.6 (4.8 - 14.7)
Age when first exchanged sex for money								
< 15 years	13	2.5 (1.1 - 4.6)	6	1.1 (0.2 - 2.4)	3	2.3 (0.0 - 5.4)	22	5.4 (2.1 - 8.5)
15 - 19 years	142	46.9 (38.7 - 55.4)	104	48.6 (37.7 - 58.3)	60	20.6 (13.9 - 28.5)	155	51.5 (43.2 - 60.4)

≥ 20 years	154	50.6 (42.0 - 58.6)	146	50.3 (40.5 - 61.2)	244	77.1 (69.2 - 84.0)	139	43.1 (34.5 - 52.1)
Ever had anal sex	132	36 (29.2 – 43.0)	85	31.9 (23.0 – 42.0)	65	18.3 (12.3 - 25.2)	149	41.4 (33.1 - 49.1)

Recent sexual partnerships among FSW

Table 6.2.4 describes recent sexual partnerships with "client" and "non-client" partners among FSW. For the purposes of the IBBSS, the term *"client"* refers to a partner with whom engagement in sexual intercourse is exclusively transactional in nature (i.e., monetary payment in exchange for sex). The term *"non-client"* refers to partners with whom engagement in sexual intercourse is not exclusively transactional in nature. A non-client may be a spouse, boyfriend, or casual partner.

The number of client sexual partners during the 30 days preceding the IBBSS among FSW varied across study sites. In Katima Mulilo, Swakopmund/Walvis Bay, and Windhoek the greatest proportion of FSW had fewer than five client partners in the past month, whereas more FSW in Oshikango had five to nine client partners during the preceding 30 days. Relative to the other three sites, Oshikango also had the greatest proportion of FSW who had 15 or more client sex-partners during the 30 days preceding the IBBSS (36.9%).

Approximately half of the FSW in Katima Mulilo and Oshikango had at least one non-client sex partner during the 30 days preceding the IBBSS. A greater proportion of FSW in Windhoek (almost 80%) had at least one non-client sex partner during the 30 days preceding the IBBSS. Multiple non-client sexual partnerships were prevalent in all sites, with 30.5%, 26.9%, 20.6%, 45.1% of FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, respectively, having three or more non-client sex partners during the 30 days preceding the IBBSS.

Table 6.2.4: Recent sexual behavior with client and non-client partners among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.

	Katima Mulilo		Oshikango		Swakopmund / Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**
Number of client partners during 30 days preceding IBBSS †								
< 5	186	68.2 (61.3 - 75.2)	24	12.4 (6.6 – 19.0)	151	50.5 (40.5 - 59.2)	139	45.3 (37.8 - 54.0)
5 - 9	88	21.7 (16.8 - 27.6)	83	37.6 (28.4 - 46.9)	95	30.9 (23.7 - 38.9)	94	31.8 (24.2 - 40.1)
10 -14	19	5.0 (2.2 - 8.2)	33	13.1 (7.5 - 19.6)	22	8.2 (3.9 - 13.1)	24	6.4 (3.5 - 9.7)
≥ 15	16	5.1 (1.8 - 8.7)	116	36.9 (27.1 - 47.3)	39	10.4 (6.1 - 16.9)	59	16.5 (10.5 - 21.7)
Number of non-client partners during 30 days preceding IBBSS ‡								
None	129	46.4 (38.7 - 54.6)	151	55.5 (45.7 - 66.6)	132	44.4 (36.7 - 52.0)	61	22.2 (14.8 - 29.9)
1-3	78	23.1 (17.1 - 29.4)	42	17.6 (10.9 - 25.2)	109	35.0 (27.7 - 42.7)	97	32.7 (25.3 - 40.8)
≥ 3	102	30.5 (23.8 - 37.2)	63	26.9 (17.2 - 36.1)	66	20.6 (14.5 - 27.2)	158	45.1 (36.9 - 53.6)
Total number of partners *(client plus non-client)* **during 30 days preceding IBBSS**								
< 5	107	43.3 (35.7 - 50.8)	16	9.8 (4.6 - 16.2)	93	33.1 (24.7 - 41.5)	71	22.5 (14.0 - 29.2)
5 - 9	142	39.6 (32.6 - 47.1)	70	27.7 (18.9 - 36.2)	136	44.5 (36.0 - 51.5)	115	41.3 (34.1- 51.3)
10 -14	31	9.0 (5.5 - 13.3)	45	22.5 (15.3 - 32.5)	35	12.2 (7.7 - 18.1)	46	12.8 (8.3 - 17.8)
≥ 15	29	8.1 (4.1 - 12.8)	125	40.0 (29.6 - 49.5)	43	10.2 (6.0 - 16.6)	84	23.4 (17.0 - 30.5)

† *"Client" refers to a partner with whom engagement in sexual intercourse is exclusively transactional in nature (i.e., monetary payment in exchange for sex).* ‡ *"Non-client" refers to partners with whom engagement in sexual intercourse is not exclusively transactional in nature. A non-client may be a spouse, boyfriend or casual partner.*

Condom use among FSW

Consistent condom use (i.e., 100%) with client sex-partners varied by study site, ranging from 29.3% among FSW in Katima Mulilo to 50.1% among FSW in Windhoek **(Table 6.2.4).** Zero percent condom use was also most prevalent among FSW in Katima Mulilo (33.8%). Despite the inconsistent use of condoms with client sex-partners, more than 80% of FSW in each study site used a condom the most recent time that they had sex with a client sex-partner. However, it should be noted that the self-report of condom use with clients among FSW in Katima Mulilo appears to be inconsistent; 30% of FSW reported that they never used condoms with any of their clients, but 91.1% of FSW reported that they used a condom during the most recent time they had sex with a client. This inconsistency may be attributable to the fact that data were available from only 159 (52%) of participants in Katima Mulilo on the *"condom at most recent sex with client sex-partner"* element of the behavioral questionnaire. Therefore, this result should be interpreted with caution and the expectation that some systematic information bias may be present.

Consistent condom use with non-client sex partners also varied by study site, ranging from 29.3% among FSW in Windhoek to 45.1% among FSW in Katima Mulilo and Oshikango. Relative to condom use with client partners, FSW in Katima Mulilo and Oshikango appear to use condoms more consistently with their non-client sex partner and FSW in Swakopmund/Walvis Bay and Windhoek appear to use condoms less consistently with their non-client sex partners. The majority of FSW across all study sites reported using a condom with their most recent non-client sex partner (ranging from 88.5% in Katima Mulilo to 94.2% in Swakopmund/Walvis Bay). Nearly all FSW in each site perceived condoms to be very affordable and very easy to access.

Table 6.2.5: Recent condom use and perceptions about condom affordability and access among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.

	Katima Mulilo		Oshikango		Swakopmund / Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**
Percent of client sex-partners with whom condom was used during 30 days preceding IBBSS †								
0 %	104	33.8 (26.0 - 42.4)	21	8.6 (4.2 - 13)	20	6.5 (2.0 - 11.1)	40	12.8 (8.0 - 17.0)
> 0 % but <100 %	111	36.9 (29.3 - 44.5)	136	53.2 (43.5 - 63.5)	100	32.6 (25.2 - 41.6)	128	37.1 (29.3 - 46.0)
100 %	92	29.3 (21.6 - 37.4)	98	38.2 (28.2 - 48.9)	186	60.9 (52.1 - 70.5)	146	50.1 (41.6 - 58.6)
Percent of non-client sex partners with whom condom was used during 30 days preceding IBBSS ‡, §								
0 %	67	39.9 (30.5 - 51.3)	11	11.3 (2.2 - 24.2)	36	10.6 (6.6 - 14.7)	61	20.1 (14.1 - 27.6)
> 0 % but <100 %	34	15.0 (8.4 - 21.8)	42	43.6 (27.5 - 60.8)	29	8.6 (4.5 - 13.4)	93	26.5 (19.1 - 33.4)
100 %	79	45.1 (34.3 - 55.1)	52	45.1 (29.1 - 62.1)	109	35.8 (28.1 - 44.2)	97	29.4 (23.1 - 37.4)
Condom used at last sex with most recent client sex-partner †	131	91.1 (79.8 - 96.3)	165	82.1 (73.1 - 91.7)	232	86.8 (74.5 - 94.0)	198	84.2 (74.2 - 89.9)
Condom used at last sex with most recent non-client sex partner ‡, §	93	88.5 (78.9 - 96.3)	77	88.7 (84.6 - 99.4)	131	94.2 (89.8 - 99.0)	156	87.0 (75.1 - 93.2)
Perceives condoms to be affordable	247	98.1 (96 - 99.6)	219	86.3 (79.6 - 91.9)	284	92.3 (86.7 - 96.8)	264	88.4 (82.0 - 93.7)
Perceives condoms to be easy to access	237	94.2 (89.8 - 97.9)	214	85.3 (78.0 - 90.9)	283	93.0 (87.7 - 96.9)	260	91.1 (86.5 - 95.2)

† *"Client" refers to a partner with whom engagement in sexual intercourse is exclusively transactional in nature (i.e., monetary payment in exchange for sex).* ‡ *"Non-client" refers to partners with whom engagement in sexual intercourse is not exclusively transactional in nature. A non-client may be a spouse, boyfriend or casual partner.* § *only includes data from participants who had a non-client sex partner during 30 days preceding IBBSS.*

Experiences of discrimination, abuse, and sexual violence among FSW

Cases of discrimination, verbal abuse, and physical violence experienced by FSW varied by study site **(Table 6.2.6).** The percentage of FSW who experienced any discrimination as a result of being FSW (including any of the following: refused health care service, refused employment, refused church or religious services, refused restaurant, refused housing, or refused police service or assistance) during the twelve months preceding the survey ranged from 3.6% in Katima Mulilo to 25.6% in Windhoek. Experience of verbal abuse was frequent among FSW in each site, and especially so in Oshikango and Swakopmund/Walvis Bay, where 57.5% and 50.1% of FSW, respectively, were verbally abused in the last twelve months. Physical assault and rape were experienced by <10% of FSW in Katima Mulilo, Oshikango and Swakopmund/Walvis Bay, while in Windhoek, 18.2% of FSW were physically assaulted and 12.9% were sexually assaulted.

Table 6.2.6: Experiences of discrimination, abuse and sexual violence among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.

	Katima Mulilo		Oshikango		Swakopmund / Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**
Experienced any discrimination as a result of being FSW during 12 months preceding the IBBSS †	15	3.6 (1.6 - 6.0)	67	21.9 (15.2 - 29.4)	46	13.5 (7.9 - 19.4)	90	25.6 (17.4 - 32.7)
Verbally abused during 12 months preceding the IBBSS	56	17.4 (11.8 - 23.7)	153	57.5 (47.4 - 67.7)	161	50.1 (41.3 - 59.4)	126	31.1 (22.8 - 37.5)
Physically abused during 12 months preceding the IBBSS	15	4.8 (1.8 - 8.8)	23	7.4 (3.9 - 11.5)	24	6.8 (3.2 - 11.0)	83	18.2 (12.3 - 25.1)
Sexually assaulted or raped during 12 months preceding the IBBSS	4	1.0 (0.0 - 2.5)	6	2.3 (0.2 - 5.1)	13	4.2 (1.1- 8.2)	46	12.9 (8.5 - 17.8)

† Experienced any of the following as a result of being FSW during the twelve months preceding the IBBSS; refused health care service; refused employment; refused church or religious services; refused restaurant; refused housing, or; refused police service or assistance.

Alcohol and drug use among FSW

Alcohol abuse was highly prevalent among FSW in each study site; 93.3 %, 88.5 %, 79.5 %, and 93.6 % of FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, respectively, screened positive for alcohol abuse using the AUDIT-C measure **(Table 6.2.7)**. The AUDIT-C measure is composed of three questions with possible scores of 0–4 for each answer. The sum of the scores for the three questions results in possible AUDITC scores of 0 - 12 points. The recommended screening threshold and the one used in the IBBSS was ≥3 points for women. The following questions and scoring were used:

1. *How often do you have a drink containing alcohol? – Scoring: ((Never (0 points), Monthly or less (1 point), Two to four times a month (2 points), Two to three times a week (3 points), Four or more times a week (4 points));*
2. *How many drinks containing alcohol do you have on a typical day when you are drinking? – Scoring: ((1 or 2 (0 points), 3 or 4 (1 point), 5 or 6 (2 points), 7 to 9 (3 points), 10 or more (4 points))*
3. *How often do you have six or more drinks on one occasion? – Scoring: ((Never (0 points), Less than monthly (1 point), Monthly (2 points), Weekly (3 points), Daily or almost daily (4 points))*

The percentage of FSW who ever used any illicit drugs (including marijuana, cocaine, ecstasy, methamphetamine, or heroin) ranged from 8.8% in Swakopmund/Walvis Bay to 19.3% in Windhoek. Use of injection drugs was virtually non-existent among FSW. However, a range of 2.1% (Katima Mulilo) to 11.5% (Windhoek) of FSW in the four study sites had a recent sex partner who injected illicit drugs.

Table 6.2.7: Alcohol and illicit drug use among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.

	Katima Mulilo		Oshikango		Swakopmund / Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**
Screened positive for alcohol abuse (using AUDIT-C measure) †	296	93.3 (88.6 - 97.1)	229	88.5 (83.2 - 93.2)	243	79.5 (72.2 - 84.9)	300	93.6 (88.3 - 97.5)
Ever used any illicit drugs	37	13.1 (7.8 - 18.7)	31	11.4 (5.5 - 18.1)	32	8.8 (4.8 - 14.0)	74	19.3 (13.8 - 25.7)
Ever injected illicit drugs with a syringe	2	0.0 (0.0 - 0.0)	0	(- -) ‡	2	(- -) ‡	2	0.5 (0.0 - 1.3)
Had sex with partner who injects drugs with a syringe during six months preceding IBBSS	9	2.1 (0.6 - 4.3)	20	7.6 (3.4 - 13.0)	15	4.1 (1.2 - 7.9)	46	11.5 (7.1 - 16.5)

† *The AUDIT-C measure is a diagnostic tool that can help identify people who abuse alcohol or have alcohol dependency. The indicator is composed of three questions: 1. "How often did you drink alcohol in the last 12 months?", "How many glasses of alcohol do you consume on a typical day when drinking?" And "How often do you consume 6 or more alcoholic beverages on one occasion?"* ‡ *Estimates cannot be generated because a group ("never used injection drugs) recruited exclusively from within its own group.*

Use of healthcare services among FSW

Table 6.2.8 describes recent use of healthcare services among FSW. During the twelve months preceding the IBBSS, the percentage of FSW who sought medical care for any reason ranged from 43.7% in Swakopmund/Walvis Bay to 65.7% in Katima Mulilo. Fewer than 5.0% FSW who sought healthcare services during the last twelve months in Oshikango, Swakopmund/Walvis Bay, and Windhoek experienced difficulty in doing so, while 20.9% of FSW in Katima Mulilo experience difficulty accessing healthcare services. Fewer than 10% of FSW who sought to fill a prescription during the last twelve months in each study site experienced difficulty in doing so.

Table 6.2.8: Use and access to medical care among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.

	Katima Mulilo		Oshikango		Swakopmund / Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**
Sought healthcare for any reason during 12 months preceding IBBSS	192	65.7 (58.4 - 73.2)	136	51.7 (42.0 - 61.2)	147	43.7 (36.2 - 51.6)	164	48.6 (39.6 - 56.5)
Experienced difficulty accessing healthcare service during 12 months preceding IBBSS *(among FSW who sought care)*	34	20.9 (12.6 - 29.2)	3	3 (0.0 - 7.6)	10	3.8 (1.3 - 6.4)	12	4.1 (1.4 - 7.5)
Experienced difficulty filling a prescription during 12 months preceding IBBSS *(among FSW who sought a prescription)*	14	6.1 (2.5 - 10.1)	9	5.5 (1.2 - 11.5)	6	3.1 (0.5 - 6.0)	9	7.1 (0.9 - 16.0)

Recent pregnancy and use of antenatal care services among FSW

The percentage of FSW who were currently pregnant ranged from 2.6% in Katima Mulilo to 7.3% in Windhoek (Table 6.2.9). Approximately half or more FSW in each study site had given birth during the five years preceding the IBBSS. The majority of FSW who had given birth during the five years preceding the IBBSS attended antenatal care (ANC) services during their most recent pregnancy (98.5% in Katima Mulilo, 96.2% in Oshikango, 97.5% in Swakopmund/Walvis Bay, 89% in Windhoek**).** Nearly all FSW who had given birth during the five years preceding the IBBSS and attended ANC services were offered an HIV test when they received ANC.

Table 6.2.9: Recent pregnancy and use of antenatal care services among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.

	Katima Mulilo		Oshikango		Swakopmund / Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**
Currently pregnant at time of IBBSS	10	2.6 (0.9 - 4.6)	13	5.9 (2.3 - 10.3)	6	6.2 (0.7 - 6.4)	19	7.3 (2.9 - 13.2)
Given birth during 5 years preceding IBBSS	145	48.2 (40.5 - 55.8)	157	65 (55.7 - 74.7)	143	47.1 (39.6 - 54.7)	184	56.0 (47.7 - 64.2)
Received antenatal care services during pregnancy of most recent birth *(among FSW who gave birth during 5 years preceding IBBSS)*	143	98.5 (95.0 - 100)	155	96.2 (91.3 - 99.7)	128	94.1 (89.3 - 98.4)	164	89.0 (82.3 - 94.6)
Offered an HIV test during antenatal care services *(among FSW who gave birth during 5 years preceding IBBSS and received antenatal care)*	138	97.0 (93.2 - 99.6)	153	97.0 (90.0 - 100)	120	97.5 (94.5 - 99.4)	156	94.0 (86.2 - 99.0)

Recent diagnosis or symptoms and treatment of STI among FSW

Table 6.2.10 describes recent diagnosis or symptoms, including vaginal ulcers or discharge, of sexually transmitted infections (STI) among FSW. The percentage of FSW who reported diagnosis or symptoms of STI during the 12 months preceding the IBBSS ranged from 15.3% in Oshikango to 35.6% in Windhoek. The percentage of FSW with diagnosis or symptoms of STI who sought treatment for STI ranged from 72.8% in Windhoek to 92.2% in Oshikango. Among FSW who sought treatment for STI, the majority in each study site sought treatment at a government clinic, and the majority were also satisfied with the service they received from the healthcare worker when they sought treatment.

Table 6.2.10: Recent diagnosis or symptoms of sexually transmitted infection (STI) among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.

	Katima Mulilo		Oshikango		Swakopmund / Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**
Had symptoms or diagnosis of STI *(vaginal discharge or ulcer)* **during 12 months preceding IBBSS**	99	31.2 (24.3 - 38.3)	54	15.3 (9.9 - 21.7)	81	21.7 (15.8 - 28.2)	118	35.6 (28.0 - 43.7)
Sought treatment for symptoms of STI *(among FSW who had symptoms or diagnosis)*	75	75.8 (62.8 – 87.0)	45	92.2 (83.4 - 98.0)	63	74.9 (61.0 - 86.9)	80	72.8 (63.1 - 83.6)
Sought treatment for STI at government clinic *(among FSW who sought treatment)*	75	89.0 (71.9 - 98.8)	43	96.5 (88.9 - 100)	58	85.2 (73.6 - 94.0)	80	91.3 (81.8 - 99.4)
Satisfied with quality of services when seeking treatment for STI *(among FSW who sought treatment)*	72	98.0 (95.1 - 100)	43	100.0 (- -) †	54	86.5 (74.4 - 96.2)	70	81.4 (65.8 - 94.5)

† **Estimates cannot be generated because a group ("satisfied with quality of STI services) recruited exclusively from within its own group.**

HIV prevention knowledge and awareness of ARV medications to treat HIV and prevent mother to child transmission of HIV among FSW

Table 6.2.11 presents data on comprehensive knowledge about HIV prevention. Comprehensive HIV transmission knowledge was measured via five statements relating modes of preventing HIV infection and three common misconceptions about HIV transmission that participants were asked to identify as being either true or false, including: 1. People can reduce the risk of being infected with HIV if they have only one uninfected sex partner who has no other male or female sex partners; 2. People CAN protect themselves from HIV by using condoms every time they have sex; 3. A healthy looking person CAN be HIV-positive; 4. People cannot be infected with HIV through mosquito bites; 5. People cannot be infected with HIV/AIDS by sharing a meal with an infected person. This measure was recommended by UNGASS at the time that the IBBSS protocol was developed. Participants were classified as having "correct" HIV transmission knowledge if they correctly identified all five statements as being true or false. The proportion of FSW who displayed correct HIV prevention knowledge ranged from 40.5% in Windhoek to 72.4% in Oshikango.

Table 6.2.11 also presents results about correct knowledge about prevention of mother to child transmission (PMTCT) of HIV services among FSW. Comprehensive PMTCT knowledge was measured via four statements relating to modes PMTCT that participants were asked to identify as being either true or false, including; *1. HIV can be transmitted from a mother to her baby during pregnancy; 2. HIV can be transmitted from a mother to her baby during delivery; 3. HIV can be transmitted from a mother to her baby during breastfeeding,* and*; 4. ARV can reduce the risk of MTCT*. Participants were classified as having "correct" PMTCT knowledge if they correctly identified all four statements as being either true or false. Correct knowledge about PMTCT among FSW ranged from 52.7% in Windhoek 72.6% in Oshikango. The statement most frequently misidentified by FSW in each site was, *"HIV can be transmitted from a mother to her baby during pregnancy"*. Approximately 90% or more FSW in each site did know that antiretroviral medication can be used to reduce the risk of MTCT.

Table 6.2.11: Knowledge about HIV transmission and prevention of mother to child transmission (PMTCT) among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.

	Katima Mulilo		Oshikango		Swakopmund / Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**
Correct knowledge about HIV transmission †	157	46.6 (40.2 - 54.7)	197	72.4 (63.4 - 80.6)	223	69.3 (61.8 - 76.8)	146	40.5 (33.3 - 48.7)
Correct knowledge about HIV transmission relating to PMTCT ‡	213	66.1 (57.4 - 73.6)	195	72.6 (63.8 - 81.2)	214	70.7 (63.6 - 77.7)	184	52.7 (44.8 - 61.1)

† *Comprehensive HIV transmission knowledge was measured via five statements relating modes of preventing HIV infection and three common misconceptions about HIV transmission that participants were asked to identify as being either true or false, including; 1. People can reduce the risk of being infected with HIV if they have only one HIV negative sex partner who has no other male or female sex partners; 2. People CAN protect themselves from HIV by using condoms every time they have sex; 3. A healthy looking person CAN be HIV-infected; 4. People cannot be infected with HIV through mosquito bites; 5. People cannot be infected with HIV/AIDS by sharing a meal with an HIV positive person. This measure was recommended by UNGASS at the time that the IBBSS protocol was developed. Participants were classified as having "correct" HIV transmission knowledge if they correctly identified all five statements as being true or false.* ‡ *Comprehensive PMTCT knowledge was measured via four statements relating to modes PMTCT that participants were asked to identify as being either true or false, including; 1. HIV can be transmitted from a mother to her baby during pregnancy; 2. HIV can be transmitted from a mother to her baby during delivery; 3. HIV can be transmitted from a mother to her baby during breastfeeding, and; 4. ARV can reduce the risk of MTCT. Participants were classified as having "correct" PMTCT knowledge if they correctly identified all four statements as being either true or false.*

Receipt of HIV-focused peer outreach and prevention interventions among FSW

Among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek 37.8%, 75.2%, 82.9%, and 58.2%, respectively, *"received HIV prevention interventions"* according to the GARPR definition (i.e., answered yes to both questions; *1."Do you know where to receive a free HIV test?"; 2. "Have you received free condoms in the during the twelve months preceding the IBBSS?"*) **(Table 6.2.12)**. Most FSW did not have contact with an HIV-focused peer educator during the six months preceding the IBBSS with percentages of those who did ranging from 10.6% in Swakopmund/Walvis Bay to 26.4% in Oshikango. Similarly, a minority of FSW received any HIV-focused literature during the twelve months preceding the IBBSS, with percentages of those who did ranging from 15.9% in KEE to 37.7% in Oshikango. Approximately one in four FSW in each site participated in and HIV-focused meeting or group discussion during the twelve months preceding the IBBSS.

Table 6.2.12: Receipt of HIV focused peer outreach and prevention interventions among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.

	Katima Mulilo		Oshikango		Swakopmund / Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**
Reached with prevention programs during 6 months preceding the IBBSS *(according to GARPR definition)* †	135	46.9 (39.3 - 54.9)	207	73.6 (64.9 - 81.5)	227	68.4 (60.1 - 76.1)	161	50.8 (41.8 - 59.0)
Had contact with an HIV-focused peer educator during 6 months preceding the IBBSS	47	13.1 (8.3 – 18.0)	75	25.2 (16.1 - 34.9)	42	10.6 (5.6 - 15.7)	61	18.8 (12.9 - 26.1)
Participated in an HIV-focused meeting during 6 months preceding the IBBSS	77	24.5 (17.5 - 31.6)	95	30.8 (22.0 - 39.4)	80	20.2 (13.2 - 27.4)	87	26.0 (19.1 - 33.8)
Received HIV/AIDS related pamphlet/literature during 6 months preceding the IBBSS	47	15.9 (9.6 - 22.1)	101	37.7 (27.0 - 47.6)	118	33.3 (26.8 - 40.4)	101	28.9 (20.9 - 36.3)

† *Global AIDS Progress Reporting (GARPR) indicator definition: Answered yes to both questions; "Do you know where to receive a free HIV test?"; "Have you received free condoms during the during 12 months preceding the IBBSS?"*

Awareness and use of HIV counseling and testing services among FSW

Table 6.2.13 describes awareness and use of HIV counseling and testing services among FSW. Nearly all FSW in each study site knew where they could get an HIV test (range: 92.5% in Windhoek to 100% in Swakopmund/Walvis Bay). 80.1% of FSW in Katima Mulilo had ever been tested for HIV, 99.4% of FSW in Oshikango had been tested for HIV, 94.3% of FSW in Swakopmund/Walvis Bay and 77.8% of FSW in Windhoek had been tested for HIV. HIV testing in the 12 months prior to the IBBSS (or previous knowledge of HIV positive status) ranged from 56.9% in Windhoek to 82.1% in Oshikango.

Table 6.2.13: Awareness and use of HIV counseling and testing among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.

	Katima Mulilo		Oshikango		Swakopmund / Walvis Bay		Windhoek	
Variable	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)
Knows where to receive HIV counseling and testing	303	97.5 (94.9 - 99.4)	255	99.5 (99.1 - 100)	307	100 (- -)	298	92.5 (87.2 - 96.7)
Ever received HIV counseling and testing	246	80.1 (73.9 - 85.6)	253	99.4 (98.5 - 100)	287	94.3 (90.7 - 97.3)	266	77.8 (70.1 - 84.9)
Currently aware of HIV serostatus[†]	204	64.4 (57.0 – 72.0)	210	82.1 (73.7 - 88.7)	220	71.9 (64.5 - 80.7)	198	56.9 (47.8 - 65.7)
Tested for HIV during 12 months preceding the IBBSS *(among FSW not already known to be HIV positive)*	99	49.8 (42.2 - 57.2)	183	71.8 (62.1 - 80.6)	183	63.0 (54.6 - 71.2)	177	52.4 (44.5 - 61.7)

[†] *Tested for HIV during 12 months preceding the IBBSS or already known to be HIV positive*

6.3. HIV prevalence, continuum of engagement in HIV care services, and correlates of HIV infection among FSW

6.3.1. HIV prevalence and continuum of engagement in HIV care services

This section presents HIV prevalence among FSW and the continuum of engagement in HIV care services among HIV-positive FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek.

The primary objective of the IBBSS was to estimate HIV prevalence and associated risk factors among FSW in Namibia. An important sub-objective of the IBBSS is to understand whether or not HIV infected FSW are accessing HIV services that have been made available to them through the MOHSS and its partners. For HIV-infected persons to fully benefit from ART, they need to know they are HIV as early as possible through HIV counseling and testing, be linked to HIV care and retained, and to receive and be sustained on ART. This process is often referred to as the continuum of engagement in HIV care services[19]. Expanded HIV testing and earlier treatment of infection has the potential to reduce new infections in the general population because HIV-infected persons on treatment are less likely to transmit the virus to their HIV-negative partners.

According to the rapid test results of received by participants in the IBBSS, HIV prevalence among FSW was estimated to be 52.3% in Katima Mulilo, 31.0% in Oshikango, 39.3% in Swakopmund/Walvis Bay, and 37.5% in Windhoek **(Table 6.3.1.)**.

Table 6.3.1: HIV prevalence FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.

	Katima Mulilo		Oshikango		Swakopmund / Walvis Bay		Windhoek	
	#	RDS Adj. % (95% CI)	#	RDS Adj % (95 CI)	#	RDS Adj % (95 CI)	#	RDS Adj % (95 CI)
HIV test result [†]								
Positive	177	52.3 (44.3 - 60.3)	77	31.0 (20.7 - 40.8)	130	39.3 (30.8 - 47.7)	103	37.5 (30.0 - 46.7)
Negative	131	47.7 (39.7 - 55.7)	173	69.0 (59.2 - 79.4)	170	60.7 (52.3 - 69.2)	206	62.5 (53.3 - 70.1)

[†] *Refers to the results of the HIV rapid test that was performed on participants during the IBBSS. The percentage of FSW whose HIV rapid test result was positive is equivalent to the HIV prevalence for the study site. Among FSW who participated in the IBBSS in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay and Windhoek, 1, 6, 7, and 7, respectively, did not consent to HIV rapid testing and were therefore not tested.*

In Figure, the results from the four study sites are pooled to illustrate the continuum of engagement in HIV care services among all HIV-infected FSW who participated in the IBBSS. Crude (i.e., not RDS adjusted) estimates are presented here. Among 487 HIV-infected FSW who participated in the IBBSS in the four study sites, 278 (57.1%) were aware of their HIV infection (i.e., previously diagnosed prior to testing during the IBBSS) 264 (54.2%) ever received HIV care from a health care provider, 237 (48.7%) were currently in care (i.e., had received care from a medical provider during the twelve months

preceding the IBBSS), 172 (35.3%) had ever received ART, and 164 (33.7%) were currently receiving ART (i.e., had received care from a medical provider relating to the ART monitoring during the twelve months preceding the IBBSS).

With only 33.7% of HIV infected FSW currently on ART, the potential for onward transmission of infection to HIV-negative sex partners is high. The low proportion of HIV-positive FSW on ART was largely the result of the level of diagnosis. Among the 278 HIV-infected FSW who were aware of their infection, 264 (95.0%) FSW were linked to care, of whom 237 (89.8%) were retained in care, and 164 of 172 (95.3%) FSW who ever received ART were currently receiving ART.

Levels of engagement at different steps in the continuum of HIV care services varied by IBBSS site (**figures 11-14**), showing a similar pattern as overall. In all four sites, awareness of serostatus was low, resulting in the overall proportion of HIV infected FSW on treatment being low. Engagement in subsequent steps in the continuum were relatively high following diagnosis of HIV infection. Among 177 HIV-infected FSW in Katima Mulilo, 100 (56.5%) were aware of their HIV infection (i.e., diagnosed), 95 (53.7%) ever received HIV care from a health care provider, 88 (49.7%) were currently in care, 64 (36.2%) had ever received ART and 64 (36.2%) were currently receiving ART. Among 77 HIV-infected FSW in Oshikango, 50 (64.9%) were aware of their HIV infection, 42 (54.5%) ever received HIV care from a health care provider, 39 (50.6%) were currently in care, 26 (33.8%) had ever received ART and 26 (33.8%) were currently receiving ART. Among 130 HIV-infected FSW in Swakopmund / Walvis Bay, 81 (62.3%) were aware of their HIV infection, 80 (61.5%) ever received HIV care from a health care provider, 70 (53.8%) were currently in care, 49 (37.7%) had ever received ART and 48 (36.9%) were currently receiving ART. Among 103 HIV-infected FSW in Windhoek, 47 (45.6%) were aware of their HIV infection, 47 (45.6%) ever received HIV care from a health care provider, 40 (38.8%) were currently in care, 33 (32.0%) had ever received ART and 26 (25.2%) were currently receiving ART.

Figure 10. Continuum of engagement in HIV care services among HIV infected FSW, pooled, RDS-non-adjusted results from Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek IBBSS sites, Namibia, 2013 - 2014.

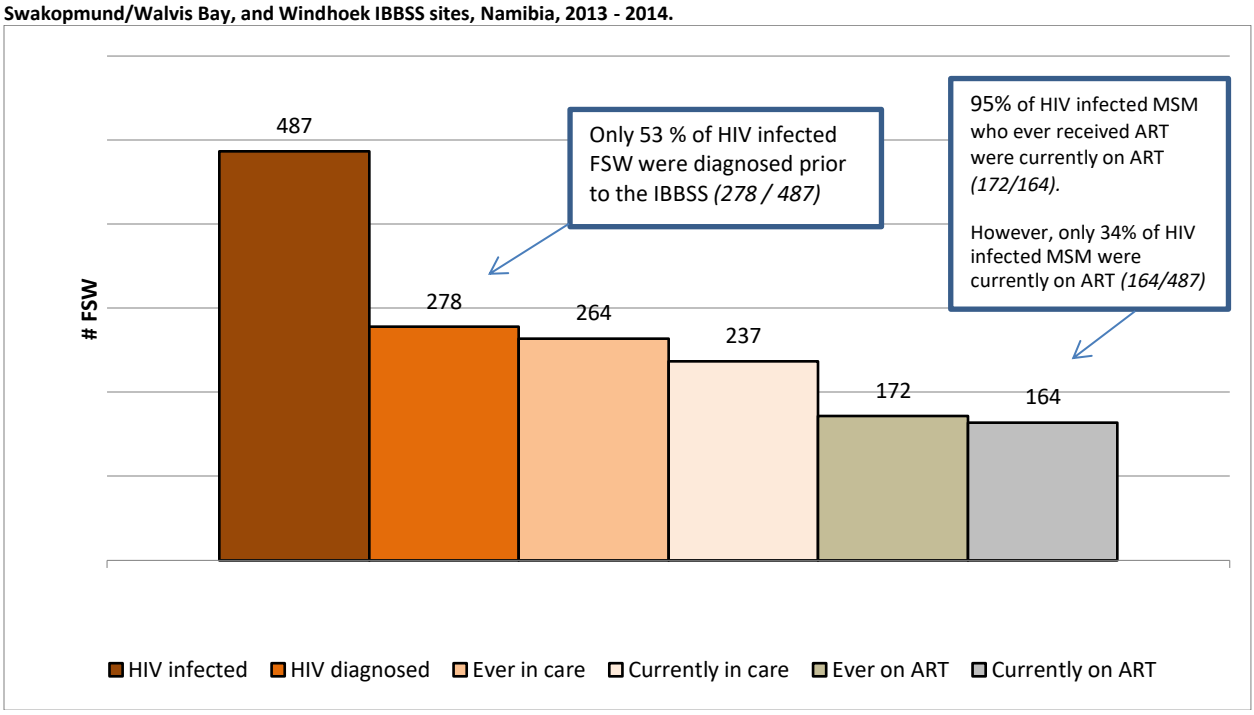


Figure 11. Continuum of engagement in HIV care services among HIV infected FSW in Katima Mulilo, Namibia, 2013 - 2014

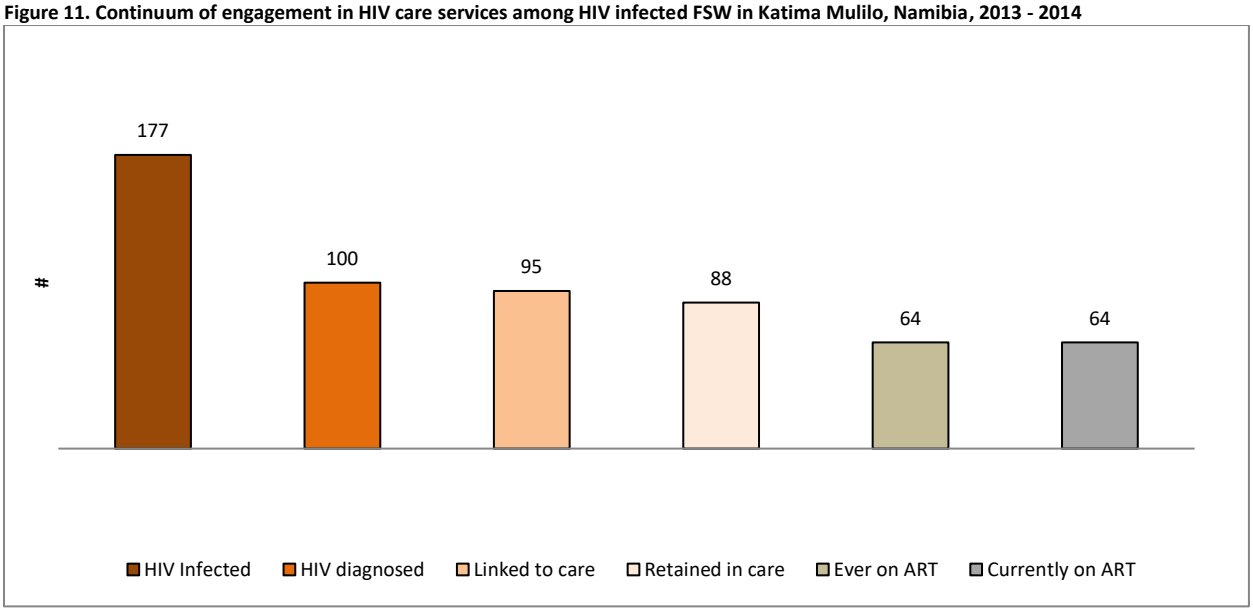


Figure 12. Continuum of engagement in HIV care services among HIV infected FSW in Oshikango, Namibia, 2013 - 2014.

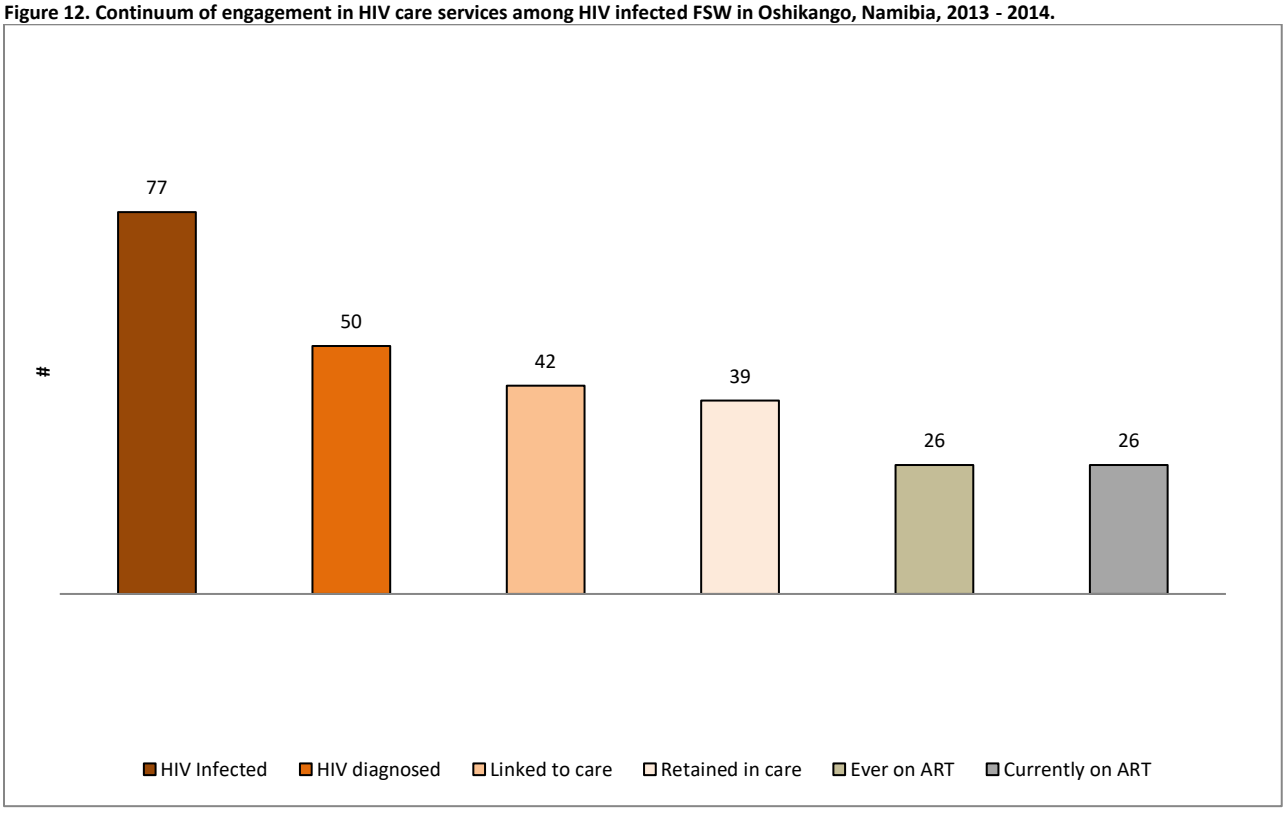


Figure 13. Continuum of engagement in HIV care services among HIV infected FSW in Swakopmund / Walvis Bay, Namibia, 2013 - 2014

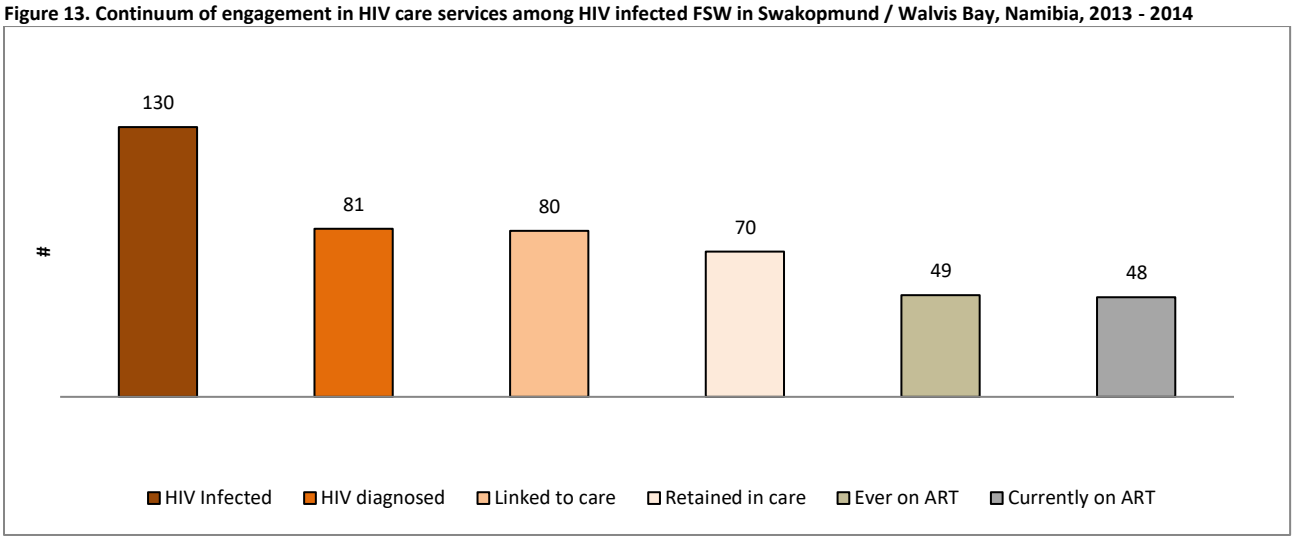
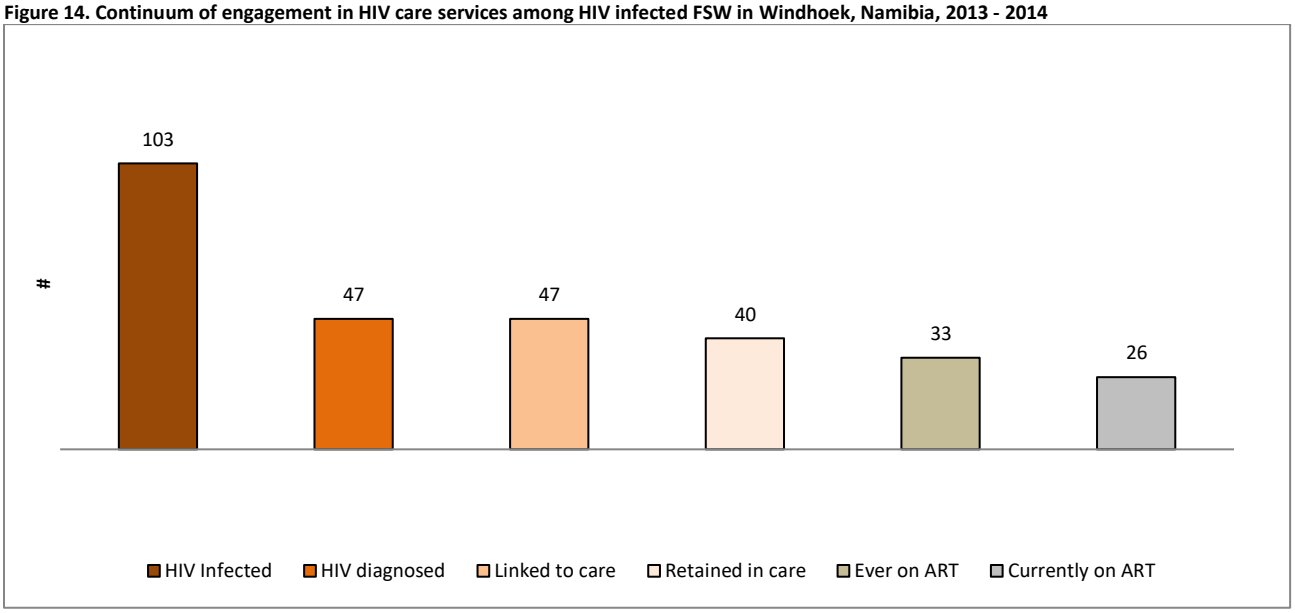


Figure 14. Continuum of engagement in HIV care services among HIV infected FSW in Windhoek, Namibia, 2013 - 2014



6.3.2. Risk factors for HIV infection among FSW

In this section HIV prevalence results are stratified by demographic variables, sexual behavior with client and non-client sex partners, consumption of alcohol and illicit drugs, and experiences of discrimination and physical violence. Significant differences (i.e., P < 0.05) are indicated in the results tables by an asterisk ("*") and, borderline significant differences (i.e., P < 0.10) are indicated in the results tables by two asterisks ("**"). Differences that were non-significant but sufficiently different for inclusion in multivariable models (i.e., P < 0.20) are indicated in the results with three asterisks ("***"). The reference strata for statistical testing of each variables association with HIV infection is indicated with by the "^" symbol. Stratified analysis of HIV prevalence is intended to assist the MOHSS and its partners to establish risk-profiles for infection that can be used to develop targeted interventions for primary prevention and identification of existing infections among women who may not be engaged in care.

Table 6.3.2.1. HIV prevalence stratified by age and marital status among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.

	Katima Mulilo		Oshikango		Swakopmund / Walvis Bay		Windhoek	
Variable	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)
Age								
18-24 years	43	31.0 (22.8 - 44.8) ^	22	26.4 (10.7 - 40.8) †	6	14.9 (1.6 - 31) †	16	19.8 (10.3 - 34.7) †
25-34 years	90	58.7 (46.1 - 69.1) *	40	27.3 (15.2 - 41.9)	91	44.0 (34.6 - 55) *	43	38.1 (24.8 - 49.4) *
≥ 35 years	43	94.8 (87.2 - 99.7) *	15	70.6 (37.0 – 96.0) †	33	46.2 (30.2 - 64.4) *	44	56.6 (40.5 - 74.8) **
Marital status								
Ever married	46	68.9 (50.5 - 86.0) †	8	53.7 (23.4 - 81.6) †	15	33.6 (14.4 - 61.9) †	13	29.4 (13.5 - 48.7) †
Never married	131	47.9 (39.7 - 57.2) *	69	29.4 (18.4 - 39.6) ***	115	39.9 (30.5 - 48.5)	90	38.7 (30.5 - 49.2)

*** Indicates a significant difference (P≤0.05) in HIV prevalence between strata, ** indicates a borderline significant difference (P≤0.1) in HIV prevalence between strata. Indicates a non-significant but sufficient difference between strata for inclusion in multivariable models (P ≤ 0.2). † Indicates the reference strata of statistical tests for difference.**

HIV prevalence was significantly or borderline significantly higher among older FSW than among younger FSW in each study site **(Table 6.3.2.1).** HIV prevalence among FSW age 18-24 years was 31.0%, 26.4%, 14.9%, and 19.8% in the Katima Mulilo, Oshikango, Swakopmund/Walvis Bay and Windhoek study sites, respectively. In comparison, HIV prevalence among FSW age ≥ 35 years was 94.8 %, 70.6 %, 46.2 %, and 56.6 % in the Katima Mulilo, Oshikango, Swakopmund/Walvis Bay and Windhoek study sites, respectively. HIV prevalence was significantly higher among FSW in Katima Mulilo who were currently or previously married (68.9%) than among those who had never been married (47.9%).

Table 6.3.2.2. HIV prevalence stratified by age education, employment and marital status among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.

Variable	Katima Mulilo #	Katima Mulilo RDS Adj. % (95% CI)	Oshikango #	Oshikango RDS Adj. % (95% CI)	Swakopmund / Walvis Bay #	Swakopmund / Walvis Bay RDS Adj. % (95% CI)	Windhoek #	Windhoek RDS Adj. % (95% CI)
Highest level of education completed								
primary or less	55	55.8 (42.8 - 69.2) †	28	47.7 (29.7 - 66.5) †	36	72.3 (55.1 - 86.7) †	40	44.4 (33.6 – 58.3) †
secondary or more	122	52.3 (41.8 - 62.0)	49	26.2 (14.6 - 38.3) **	94	36.2 (27.9 - 46.5) *	62	33.7 (24.5 – 46.4)
Currently a student								
Yes	9	26.0 (11.5 - 44.2) †	2	7.2 (0 - 91.4) †	118	45.2 (15.5 - 71.3) †	2	2.8 (0.0 – 3.7) †
No	162	57.1 (47.8 - 65.8) *	71	29.4 (18.4 - 38.7)	10	37.6 (29.1 - 46.6)	93	34.6 (27.1 - 43.9)
Employed at any time during 12 months preceding the IBBSS								
Yes	21	53.4 (35.7 - 71.6) †	14	36.6 (15.7 - 58.1) †	21	20.5 (9.2 - 35.3) †	31	25.2 (12.5 - 35.9) †
No	156	52.4 (44.1 - 61.4)	63	29.9 (18.7 - 40.9)	109	44.3 (35.1 - 53.2) *	72	41.9 (31.8 - 52.4) *

*** Indicates a significant difference (P≤0.05) in HIV prevalence between strata, ** indicates a borderline significant difference (P≤0.1) in HIV prevalence between strata. Indicates a non-significant but sufficient difference between strata for inclusion in multivariable models (P ≤ 0.2). † Indicates the reference strata of statistical tests for difference.**

HIV prevalence was significantly higher among FSW in Oshikango who completed primary education or less (47.7%) than among those who completed secondary education or more (26.2%) **(Table 6.3.2.2)**. HIV prevalence was borderline significantly higher among FSW in Swakopmund/Walvis Bay who complete primary education or less (72.3%) than among those who completed secondary education or more (36.2%). HIV prevalence was significantly higher among FSW in Katima Mulilo who were current students (26.0%) than among those who were not current students (57.1%) in Katima Mulilo. HIV prevalence was significantly higher FSW in Swakopmund/Walvis Bay and Windhoek who were not employed at any time during the twelve months preceding the IBBSS.

Table 6.3.2.3. HIV prevalence stratified by age at debut of female sex work and recent sexual partnerships among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14. †

Variable	Katima Mulilo #	Katima Mulilo RDS Adj. % (95% CI)	Oshikango #	Oshikango RDS Adj. % (95% CI)	Swakopmund / Walvis Bay #	Swakopmund / Walvis Bay RDS Adj. % (95% CI)	Windhoek #	Windhoek RDS Adj. % (95% CI)
Age when first exchanged sex for money								
< 15 years	9	54 (20.7 - 93.9) †	3	75.9 (0 - 100) †	2	82.8 (0 - 100) †	6	27.2 (6.2 - 67.2) †
15 - 19 years	67	37.2 (25.7 - 46.7) ***	23	29.4 (11.9 - 46.5) **	23	42.7 (20.8 - 58.7) ***	50	39.6 (28.1 - 51.5)
≥ 20 years	101	64.6 (54.8 - 74.2)	51	29.6 (19.4 - 39.1) **	105	37.7 (28.1 - 47.4) **	47	35.7 (24.8 - 49.5)
Number of client sex-partners during 30 days preceding IBBSS ‡								
< 10	153	50.7 (42.3 - 58.8) †	28	21.4 (12.7 - 32.2) †	109	41.4 (31.7 - 51.1) †	75	38.4 (28.8 - 48.9) †
> 10	24	65.7 (42.9 – 88.0) ***	49	39.6 (22.6 - 53.1) *	21	26.7 (14.4 - 40.7) **	28	32.9 (20.7 - 48.5)
Number of non-client sex partners during 30 days preceding IBBSS §								
None	78	55.3 (43.5 - 67.7) †	48	23.6 (14.4 - 33.6) †	54	32.9 (22.4 - 44.1) †	20	42.1 (23.7 - 63.2) †
1-3	41	50.2 (34.5 - 65.5)	14	41.2 (16.8 - 64) ***	44	41.4 (26.7 - 54.5)	32	36.4 (23.4 - 53.1)
≥ 3	58	51.0 (37.7 – 63.0)	15	36.1 (11.5 - 52.9)	32	48.7 (30.6 - 65) ***	51	34.9 (26.2 – 48.0)

*** Indicates a significant difference (P≤0.05) in HIV prevalence between strata, ** indicates a borderline significant difference (P≤0.1) in HIV prevalence between strata. Indicates a non-significant but sufficient difference between strata for inclusion in multivariable models (P ≤ 0.2). † Indicates the reference strata of statistical tests for difference. ‡ "Client" refers to a partner with whom engagement in sexual intercourse is exclusively transactional in nature (i.e., monetary payment in exchange for sex). § "Non-client" refers to partners with whom engagement in sexual intercourse is not exclusively transactional in nature. A non-client may be a spouse, boyfriend or casual partner.**

HIV prevalence was borderline significantly higher among FSW in Oshikango who began sex work before age 15 years (75.9%) than among those who began sex work at age 20 years or older (29.6%)**(Table 6.3.2.3)**. Similarly, HIV prevalence

was borderline significantly higher among FSW in Swakopmund/Walvis Bay who began sex work before age 15 years (82.8%) than among those who began sex work at age 20 years or older (37.7%). HIV prevalence was significantly higher among FSW in Oshikango who had ten or more client sex-partners during the 30 days preceding the IBBSS (39.6%) than among those who had ten or fewer client sex-partners (21.4%). In Walvis Bay/Swakopmund, HIV prevalence was borderline significantly lower among FSW with ten or more client sex-partners during preceding the IBBSS (26.7%) than among those who had ten or fewer client sex-partners (41.4%).

Table 6.3.2.4. HIV prevalence stratified by alcohol and drug use among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.

	Katima Mulilo		Oshikango		Swakopmund / Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**
Problematic consumption of alcohol (AUDIT-C) during 6 months preceding IBBSS ‡								
Yes	172	52.3 (43.4 - 60.7) ᵀ	69	32.3 (21 - 42.8) ᵀ	99	38.2 (30 - 48.6) ᵀ	97	38.4 (30.7 - 47.3) ᵀ
No	5	53.4 (13.1 - 84.1)	8	24.7 (5.5 - 46.2)	31	42.3 (24.8 - 58.7)	6	29.2 (2.1 - 69.6)
Ever used any illicit drugs								
Yes	24	52.1 (30.8 - 78.7) ᵀ	8	32.4 (7.5 - 60.7) ᵀ	8	8.0 (0.4 - 16.2) ᵀ	29	50.9 (32.5 - 66.8) ᵀ
No	153	52.0 (43.6 - 60.1)	69	31.1 (20.5 - 41.6)	122	42.3 (32.1 - 49.9) *	74	35.0 (26.8 - 46.2) ***

** Indicates a significant difference (P≤0.05) in HIV prevalence between strata, ** indicates a borderline significant difference (P≤0.1) in HIV prevalence between strata. Indicates a non-significant but sufficient difference between strata for inclusion in multivariable models (P ≤ 0.2). ᵀ Indicates the reference strata of statistical tests for difference. ‡ The AUDIT-C measure is a diagnostic tool that can help identify people who abuse alcohol or have alcohol dependency. The indicator is composed of three questions: 1. "How often did you drink alcohol in the last 12 months?", "How many glasses of alcohol do you consume on a typical day when drinking?" And "How often do you consume 6 or more alcoholic beverages on one occasion?".*

HIV prevalence did not differ significantly between FSW in any of the study sites who did and did screen positive for alcohol abuse **(Table 6.3.2.4).** HIV prevalence was significantly higher among FSW in Swakopmund/Walvis Bay who had never used any illicit (42.3%) than among of those who had ever used illicit drugs (8.0%)**.**

Table 6.3.2.5. HIV prevalence stratified by diagnosis or symptoms of STI among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.

	Katima Mulilo		Oshikango		Swakopmund / Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**
Diagnosis or symptoms of STI during 12 months preceding IBBSS								
Yes	63	56.5 (41.5 - 70.8) ᵀ	23	53.1 (34.4 - 71.0) ᵀ	44	55.5 (40.0 - 71.3) ᵀ	47	46.3 (32.3 - 58.8) ᵀ
No	114	43.5 (29.2 - 58.5)	54	46.9 (29.0 - 65.6)	86	44.5 (28.7 - 60.0)	56	53.7 (41.2 - 67.7)

** Indicates a significant difference (P≤0.05) in HIV prevalence between strata, ** indicates a borderline significant difference (P≤0.1) in HIV prevalence between strata. Indicates a non-significant but sufficient difference between strata for inclusion in multivariable models (P ≤ 0.2). ᵀ Indicates the reference strata of statistical tests for difference.*

HIV prevalence did not differ significantly between FSW in any of the study sites who did and did not have a diagnosis or symptoms of an STI during twelve months preceding IBBSS **(Table 6.3.2.5).**

Table 6.3.2.6. HIV prevalence stratified by diagnosis or symptoms of STI among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.

	Katima Mulilo	Oshikango	Swakopmund / Walvis Bay	Windhoek

Variable	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)
Experienced physical abuse or assault during 12 months preceding IBBSS								
Yes	9	74.3 (37.5 - 94.1) ᵀ	5	14.5 (1.6 - 33.4) ᵀ	10	45.0 (18.0 - 76.5) ᵀ	30	47.1 (29.9 - 65.4) ᵀ
No	168	51.3 (43.0 - 59.4) ***	72	32.6 (21.3 - 42.6) **	111	36.4 (27.8 - 45.2)	71	35.7 (26.0 - 44.1) ***

*** Indicates a significant difference (P≤0.05) in HIV prevalence between strata, ** indicates a borderline significant difference (P≤0.1) in HIV prevalence between strata. Indicates a non-significant but sufficient difference between strata for inclusion in multivariable models (P ≤ 0.2). ᵀ Indicates the reference strata of statistical tests for difference.**

HIV prevalence was borderline significantly lower among FSW in Oshikango who were phyisically assaulted or abused durinig the twelve months preceding the IBBSS (Table 6.3.2.6).

Multivariable logistic regression to assess predictors of HIV infection

Multivariable logistic regression analysis was performed to assess risk-profile variable predictors of HIV infection while controlling for potential confounding variables. Risk-profile variables were considered for inclusion in the full multivariable models if tests for statistical significance of bivariate associations **(results in section 6.3.2)** produced a *P* value ≤ 0.2. RDSAT-produced survey weights were exported and applied to the regression analysis, which was performed using Stata. Adjusted odds ratios, 95% confidence intervals and *P* values were calculated. Variables that were significantly ($P \leq 0.05$) or borderline significantly ($P \leq 0.1$) associated with HIV infection in the full multivariable were included in the final multivariable model.

Risk-profile predictors of HIV infection varied by study site **(Table 6.3.2.7)**. Among FSW in Katima Mulilo older age (AOR: 1.19 per advancing year), being currently not a student (AOR: 2.94), having a greater number of client sex-partner during the 30 days preceding the IBBBSS (AOR: 1.62), and being physically assaulted during the twelve months preceding the IBBSS (AOR: 4.71) were significantly or borderline significantly associated with an increased probability of HIV infection**.**

Among FSW in Oshikango older age (AOR: 1.13 per advancing year), completion of primary school level of education or less (AOR: 3.68), having a greater number of client sex-partner during the 30 days preceding the IBBBSS (AOR: 1.98), and having one to three non-client sex partners during the 30 days preceding the IBBSS (AOR: 4.23) were significantly associated with an increased probability of HIV infection.

Among FSW in Swakopmund/Walvis Bay older age (AOR: 1.09 per advancing year), completion of primary school level of education or less (AOR: 3.87), not being employed (AOR: 3.07), having fewer than ten client sex-partners during the 30 days preceding the IBBSS (AOR: 2.31), and having a greater number of non-client sex partners during the 30 days preceding the IBBSS (AOR: 1.11 per additional partner) were significantly or borderline significantly associated with an increased probability of HIV infection.

In Windhoek older age (AOR: 1.08 per advancing year), not being employed (AOR: 2.33), and having ever used illicit drugs (AOR: 2.11) were significantly associated with an increased probability of HIV infection.

Table 6.3.2.7. Results of multivariable logistic regression analysis to assess predictors of HIV infection among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.

	Full multivariable model ᵀ	Final multi-variable model ‡

Study site	Variable	AOR (95% CI) [§]	AOR (95% CI) [§]
Katima Mulilo			
	Age *(per advancing year)*	1.20 (1.11 - 1.30) *	1.19 (1.12 - 1.27) *
	Currently not a student *(vs. currently a student)*	2.93 (1.20 - 7.19) *	2.94 (1.20 - 7.19) *
	Currently or previously married *(vs. never married)*	0.74 (0.25 - 2.23)	(- -)
	Age at first sex work age 15-19 years *(vs. < 15 years)*	0.90 (0.25 - 3.20)	(- -)
	Number of client sex-partners during past 30 days *(per additional 4 partners)*	1.59 (1.05 - 2.41) *	1.62 (1.06 - 2.46) *
	Physically abused or assaulted during past 12 months *(vs. not abused or assaulted)*	4.65 (0.94 – 22.92) **	4.71 (0.98 – 22.73) **
Oshikango			
	Age *(per advancing year)*	1.12 (1.03- 1.23) *	1.13 (1.04 - 1.24) *
	Completed primary level of education or less *(vs. completed secondary level)*	3.87 (1.49 - 9.81) *	3.68 (1.44 - 9.39) *
	Currently or previously married *(vs. never married)*	2.91 (0.80 - 10.60)	(- -)
	Age at first sex work age < 15 years *(vs. ≥ 15 years)*	3.59 (0.33- 39.73)	(- -)
	Number of client sex-partners during past 30 days *(per additional 4 partners)*	2.02 (1.30 - 3.16) *	1.98 (1.28 - 3.07) *
	1-3 non- client sex-partners during past 30 days *(vs. no non-paying partners)*	4.53 (1.47 -14.00) *	4.23 (1.42 - 12.64) *
	Physically abused or assaulted during past 12 months *(vs. not abused or assaulted)*	0.33 (0.80 – 1.37)	(- -)
Swakopmund/Walvis Bay			
	Age *(per advancing year)*	1.09 (1.02 - 1.16) *	1.09 (1.02 - 1.17) *
	Completed primary level of education or less *(vs. completed secondary level)*	3.79 (1.57 – 9.12) *	3.87 (1.60 - 9.37) *
	Not employed at any time during twelve months preceding the IBBSS *(vs. employed)*	2.88 (1.40 – 6.20) *	3.07 (1.43 - 6.59) *
	Age at first sex work age < 15 years *(vs. ≥ 15 years)*	2.33 (0.28 - 19.28)	(- -)
	< 10 client sex-partners during the past 30 days *(vs. ≤ 10)*	2.40 (0.97 - 5.90) **	2.31 (0.98 - 5.47) **
	Number of non- client sex-partners during past 30 days *(per additional partner)*	1.12 (1.00 - 1.26) **	1.11 (1.00 - 1.24) **
	Ever used any illiciit drugs *(vs. never used drugs)*	0.45 (0.13 - 1.53)	(- -)
Windhoek			
	Age *(per advancing year)*	1.08 (1.03 - 1.13) *	1.08 (1.03 - 1.13) *
	Completed primary level of education or less *(vs. completed secondary level)*	1.12 (0.52 - 2.41)	(- -)
	Not employed at any time during twelve months preceding the IBBSS *(vs. employed)*	2.22 (1.06 - 4.23) *	2.33 (1.13 - 4.81) *
	Ever used any illicit drugs *(vs. never used drugs)*	1.94 (0.89 - 4.24) **	2.11 (1.00 - 4.46) *
	Physically abused or assaulted during past 12 months *(vs. not abused or assaulted)*	1.44 (0.61 - 3.37)	(- -)

*[†] full multivariable model includes independent variables that produced a P value ≤ 0.2 in tests for statistical significance of bivariate associations. Variables that were significantly (P < 0.05) or borderline significantly (P < 0.1) associated with HIV infection in the full multivariable were included in the final multivariable model[†]. All adjusted odds ratios (AOR) are weighted with RDSAT-exported survey weights. * Indicates a significant association (P < 0.05). ** Indicates a borderline significant association (P < 0.1). "(- -)" indicates that variable was not included in the final model and an estimate is therefore not presented.*

6.4. FSW Population Size Estimation

6.4.1. FSW population size estimation by method

The following section describes the results of the five individual population size estimation methods and the stakeholder consensus that was reached by synthesizing the results of those five methods, consideration of biases, and individual and group perspectives. The results of each size method and the stakeholder consensus are presented in **Table 6.4.1.**

Mapping

The mapping method attempted to estimate the FSW population size by visiting known venues in the study area where FSW are likely to gather, or "hotspots", and take a head count of "identifiable" FSW. During the formative assessment phase on the IBBBS, study teams visited hotspots that were identified by key informants and counted the number of identifiable FSW in each venue. Summing results, the mapping method estimated 284 FSW in Katima Mulilo, 158 FSW in Oshikango, 322 FSW in Swakopmund/Walvis Bay, and 528 FSW in Windhoek.

Key Informant interviews

Key informants were interviewed in each of the study sites, including ten in Katima Mulilo, nine in Oshikango, eight in Swakopmund/Walvis Bay, and eight in Windhoek. Each key informant was asked to provide an estimate of how many FSW they believed lived in the study location they resided in. These personal estimates were either reported as counts or as a percentage of the adult female population. The median of estimates within a study location was used as the number for that area. In sum, the key informant method estimated 300 FSW in Katima Mulilo, 100 FSW in Oshikango, 330 FSW in Swakopmund/Walvis Bay, and 100 FSW in Windhoek.

Unique Object Multiplier

A total of 343, 461, 123, and 199 unique objects (key chain torches) were distributed to FSW in the Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, Windhoek study areas, respectively, prior to implementation of the IBBSS. A total of 20, 79, 16, and 12 participants in the Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, Windhoek studies, respectively, reported that they had received a unique object prior to participating in the study. As a result, the unique object multiplier method estimated 5,299 FSW in Katima Mulilo, 1,494 FSW in Oshikango, 2,352 FSW in Swakopmund/Walvis Bay and 5,240 FSW in Windhoek.

Wisdom of the Crowd

During administration of the behavioural questionnaire component of the IBBSS, each participant was asked how many FSW age $\geq$ 18 years they believed also lived in the study area. For each study area, the median estimate of all responses from participants was taken to be the *Wisdom of the Crowd* population size. The 25^{th} and 75^{th} percentiles were used as lower and upper acceptable bounds, respectively. As a result, the wisdom of the crowd method estimated 300 FSW in Katima Mulilo, 500 FSW in Oshikango, 700 FSW in Swakopmund/Walvis Bay and 600 FSW in Windhoek.

Literature review

No data exist on prevalence of FSW behavior in Namibia. Therefore, the literature review method applied data on the percentage of adult FSW who was estimated by a recent study in Ghana, which was 0.9% (credible interval: 0.5% - 2.7%). This point estimate (0.9%) and lower (0.5%) and upper (2.7%) credible interval estimates were applied to the adult female population of the study areas in Namibia to estimate the size of FSW populations in each study area. As a result, the literature review method estimated 84 FSW in Katima Mulilo, 85 FSW in Oshikango, 241 FSW in Swakopmund/Walvis Bay and 1,582 FSW in Windhoek.

Stakeholder consensus (i.e., the "modified Delphi" method).

Two population size estimation stakeholder's workshops were convened to discuss and reach consensus on synthesizing and reconciling the results of the five individual size estimation methods and to obtain participants perspectives on the number of FSW in the sites and Namibia as a whole. The first workshop was convened in April 2014 and focused on producing population size estimates for the Swakopmund/Walvis Bay and Windhoek study areas. The second workshop was convened in July 2014 and focused on producing population size estimates for the Katima Mulilo and Oshikango study areas, and to extrapolate for the country as a whole. Representatives from the MOHSS, CDC and the United States Agency for International Development (USAID), Namibian-based NGO's that work with FSW, and FSW population members participated in the workshops.

The modified Delphi method was conducted during the stakeholder's workshops as follows. First, each stakeholder was asked to give their best estimate for the number of FSW in the sites prior to showing any results. They were also asked to provide their "acceptable bounds" defined as the number that they would not believe possible to be lower or higher than when describing the number of FSW in the area. Second, these first estimates of each stakeholder were presented to the group, along with the median, 25th and 75th percentile. Third, each stakeholder was asked to verbally provide their rationale for their estimate and whether they would now raise or lower that estimate.

Next, the facilitators presented the results of each individual population size estimate method described above (including key informant interview, mapping, WOC, UOD, and literature review). The relative strengths and limitations of each method were discussed and feedback and expert opinion of the stakeholders was solicited. Stakeholder were asked to provide their updated estimate and acceptable bounds of the population size in each of the four study areas. The median of the updated estimates (and acceptable bounds at the 25th and 75th percentile – except in Katima Mulilo where the lowest estimate was used as the lower acceptable bound) was then taken as the approximate final stakeholder consensus population size estimate in each study area.

As a result, the stakeholder consensus estimate (and acceptable bounds) of the FSW population was; 800 (380 – 2,000) in Katima Mulilo; 900 (775 – 2,750)in Oshikango; 900 (825 – 1,500) in Swakopmund/Walvis Bay, and 3,000 (1,800 – 3,400) in Windhoek **(Table 6.4.1)**

Table 6.4.1.: Population Size Estimates with Multiple Methods among FSW in Katima Mulilo, Oshikango, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.

Population size estimation method	Study site	Estimated number of FSW (Acceptable bounds)	Estimated % of adult female population who are FSW (Acceptable bounds)
Mapping			
	Katima Mulilo	284 (142 – 426)	3.1 (1.5 – 4.6)
	Oshikango	158 (79 – 237)	1.7 (0.5 – 2.5)
	Swakopmund/Walvis Bay	322 (161 -483)	1.2 (0.6 – 1.8)
	Windhoek	528 (264 – 792)	0.6 (0.3 – 0.9)
Key informant interview			
	Katima Mulilo	300 (50 – 4,300)	3.2 (0.5 – 46.2)
	Oshikango	100 (30 – 800)	1.1 (0.3 – 8.5)
	Swakopmund/Walvis Bay	330 (200 – 1,000)	1.2 (0.75 – 3.7)
	Windhoek	100 (50 – 1,700)	0.11 (0.06 – 1.9)
Unique object multiplier			
	Katima Mulilo	5,299 (3,500 – 8,575)	56.9 (37.6 – 92.1)
	Oshikango	1,494 (1,249 – 1,822)	15.9 (13.3 – 19.3)
	Swakopmund/Walvis Bay	2,352 (1,597 – 4,556)	8.8 (6.0 – 17.0)
	Windhoek	5,240 (3,373 – 11,706)	6.0 (3.8 – 13.3)
Wisdom of the crowd			
	Katima Mulilo	300 (100 – 1,000)	3.2 (1.1 – 10.7)
	Oshikango	500 (300 – 1,000)	5.3 (3.2 – 10.6)
	Swakopmund/Walvis Bay	700 (200 – 2,000)	2.6 (0.75 – 7.5)
	Windhoek	600 (200 – 1,500)	0.68 (0.23 – 1.7)
Literature review			
	Katima Mulilo	84 (47 – 251)	0.9 (0.5 – 2.7)
	Oshikango	85 (47 – 254)	0.9 (0.5 – 2.7)
	Swakopmund/Walvis Bay	241 (134 – 723)	0.9 (0.5 – 2.7)
	Windhoek	1,582 (1,055 – 2,110)	1.8 (1.2 – 2.4)
Stakeholder consensus *(i.e., "modified Delphi" method)*			
	Katima Mulilo	800 (380 – 2,000)	8.6 (4.1 – 21.5)
	Oshikango	900 (775 – 2,750)	9.6 (8.2 – 29.2)
	Swakopmund/Walvis Bay	900 (825 – 1,500)	2.8 (1.7 - 3.2)
	Windhoek	3,000 (1,800 – 3,400)	2.2 (2.0 – 3.6)

† *All percentage estimates were calculated as follows; (estimated number of FSW / total number of adult female as measured by the 2011 Namibia Population and Housing Census in the defined geographic area) x 100*

6.4.2. Extrapolation of IBBSS population size estimates other "non-IBBSS" urban and rural areas and to all of Namibia.

After the final population size estimates for each IBBSS study area were reached through stakeholder consensus, the results of these estimates were extrapolated by stakeholders to all other urban areas of Namibia where the IBBSS was not conducted, all rural areas of Namibia, and by combining with the IBBSS site estimates, Namibia in its entirety. The results of this extrapolation are presented in **Table 6.4.2.1**. The process by which this extrapolation was performed was:

1. Each stakeholder was asked to provide an estimate of the percentage (with acceptable bounds) of adult females engaging in sex work in all other *non-IBBSS* urban areas of Namibia. Stakeholders were provided the denominator of adult females from the census and instructed to take into consideration the percentage of adult females or absolute number of FSW in the aggregate area (**as described in section and table 6.4.1**). Stakeholders were also reminded that the IBBSS sites were selected as a result of formative assessment work that suggested that the four IBBSS study areas were likely to be home to larger concentrations of FSW relative to other areas of Namibia. The median of the stakeholder percentage estimates was taken as the approximate final stakeholder consensus population size estimate for all non-IBBSS urban areas of Namibia. This percentage was then applied to the number of adult females in all other *non-IBBSS* urban areas of Namibia (as measured by the 2011 Namibia Population and Housing Census) to produce a count of FSW in all other *non-IBBSS* urban areas of Namibia.

2. Each stakeholder was asked to provide an estimate of the percentage and acceptable bounds of adult females engaging in sex work in all rural areas of Namibia. Again, stakeholders were instructed to take into consideration the percentage of adult females in each IBBSS study area estimated to be FSW who were produced through stakeholder consensus and reminded that the IBBSS sites were selected as a result of formative assessment that suggested that the four areas were likely to be home to larger concentrations of FSW relative to other areas of Namibia, especially non-urban areas. The median of the stakeholder estimates was taken as the approximate final stakeholder consensus population size estimate for all rural areas of Namibia. This percentage was then applied to the number of adult females in all other *non-IBBSS* urban areas of Namibia (as measured by the 2011 Namibia Population and Housing Census) to produce a count of FSW in all rural areas of Namibia.

3. The stakeholder consensus FSW population size estimates and acceptable bounds of the four study areas were added together to produce a total count of FSW in the four IBBSS study areas.

4. The count and acceptable bounds of FSW in all non-IBBSS urban areas, all rural areas, and in all IBBSS study areas were added together to produce a count and acceptable bounds of all FSW in Namibia. This count was than divided by the total number of adult females in all of Namibia (as measured by the 2011 Namibia Population and Housing Census) and multiplied by 100 to produce estimated percentage of all adult females in Namibia who are FSW.

As a result of this process of extrapolation (**Table 6.4.2.1**), it was estimated that there are; 1,482 FSW residing in all non-IBBSS urban areas of Namibia; 1,000 FSW residing in all rural areas of Namibia; 5,600 FSW residing in all four IBBSS study areas combined, and; 8,082 FSW residing in all of Namibia.

Table 6.4.2.1: Extrapolation of stakeholder consensus estimates of the population size of FSW to all non-IBBSS urban and rural areas and extrapolation to all of Namibia, 2012-2014.

Geographic area	Estimated number of adult females [†]	Estimated number of FSW (Acceptable bounds)	Estimated % of adult female population that is FSW (Acceptable bounds)
All non-IBBSS urban areas in Namibia	131,337	1,482 (947 - 6,142)	1.1 (0.7 - 4.7)
All rural areas in Namibia	395,273	1,000 (650 – 4,743)	0.3 (0.2 - 1.2)
All IBBSS study areas combined	166,851	5,600 (3,780 – 9,650)	3.4 (2.3 – 5.8)
All of Namibia	693,461	8,082 (5,377 – 20,535)	1.2 (0.8 - 3.0)

[†] **as measured by the 2011 Namibia Population and Housing Census.**

Extrapolation to other non-IBBSS urban and rural "hotspots"

Finally, stakeholders were asked to develop a list of other, non-IBBSS urban and rural area "hotspots" wherein the percentage of adult females who are FSW is expected to be slightly greater relative to that of "non-hotspots". Non-IBBSS, urban and rural "hotspots "that were identified by stakeholders are presented in **Table 6.4.2.2**.

Table 6.4.2.2: Stakeholder consensus of possible other, non-IBBSS urban and rural FSW "hotspots" in Namibia, 2012- 2014.

Non-IBBSS, urban hotspots	Non-IBBSS, rural hotspots
Otavi	Oranjemund
Rundu	Opuwo
Otjiwarongo	Arandis
Grootfontein	Rosh pinah
Tsumeb	Outjo
Luderitz	Otavi
Gobabis	Noordoewer
	Aussenkerr
	Katwitwi
	Kongola
	Stampriet
	Aranos
	Aruab
	Gabis
	Bethanie
	Aus
	Cattle posts
	Farms

7. CONCLUSIONS AND RECOMMENDATIONS

7.1. Key Findings

Our RDS surveys successfully recruited FSW in four cities of Namibia, exceeded the targeted sample size in three out of four surveys, and enrolled a total of 1,151 FSW. Participating Namibian FSW came from all walks of life, diverse in education, employment, age, marital status, and region of residence. The first round of IBBSS for FSW in Namibia met all its objectives.

Objective # 1 was to measure HIV prevalence among FSW in Namibia. Our study found HIV prevalence among FSW to be 52.3% in Katima Mulilo, 31.0% in Oshikango, 37.3% in Swakopmund/Walvis Bay, and 39.3% in Windhoek. Each of these estimates is far above the common 5% prevalence threshold that defines a key population. HIV prevalence among FSW in our surveys was also higher relative to regional estimates for women in Namibia from the 2013 Namibia Demographic Health Survey (30.9% in Zambezi, 22.1% in Ohangwena, 14.6% in Erongo, and 12.2% in Khomas)[1] and district level estimates for pregnant women from the 2014 Namibia HIV Sentinel Survey (36.0% in Katima Mulilo, 22.8% in Engela, 19.6% in Walvis Bay, and 19.6% at Katutura)[20]. Our estimates are also comparable to, although somewhat lower than, HIV prevalence among FSW in other urban areas of southern Africa (59.6% in South Africa, 61.2% in Zimbabwe, and 70.7% in Malawi)[21] – which are among the highest in the world. Such findings may be interpreted that levels of HIV prevalence among FSW in Namibia may still increase to levels observed in urban areas of surrounding countries. Moreover, given the speed with which HIV infects young women entering the sex industry, these levels may persist in the population of FSW with each generation. The final stages of "getting to zero" new HIV infections in Namibia may therefore have to prioritize marginalized, stigmatized, and hard-to-reach key populations such as FSW.

Objective #2, measuring the uptake of health services, corroborates the challenge in reaching FSW. The majority of HIV positive FSW who were surveyed (63.8% in Katima Mulilo, 66.2% in Oshikango, 63.1% in Swakopmund/Walvis Bay, and 74.8% in Windhoek, see **Figures 11-14**) were not on ART.Lack of awareness of HIV serostatus appears is first and biggest gap in the continuum of HIV service delivery and therefore the greatest contributor to the low proportion HIV positive FSW who are receiving ART. Given the effectiveness of treatment in preventing onward transmission[22,23,24] inclusion of FSW in Namibia's developing "test and treat" policies coupled with new interventions designed to improve awareness of serostatus could prove particularly effective in averting a substantial amount of HIV infections. Other key service use indicators fall short of recommended targets, including substantial numbers not using condoms with clients and other partners. [In a few places you said that the majority have not tested - this is not true according to the data by ever, last 12 months, and knowing serostatus. Also the majority are diagnosed in 3 of the 4 sites. Am I missing what you are saying?] Although many FSW have been *"reached by prevention programs"* according to the GAPR definition (i.e., know where to get a free HIV test and received free condoms during the past twelve months), the majority have not received HIV-related prevention through community or peer based outreach. Community based and peer outreach are recommended by the WHO as effective methods of accessing FSW and are more likely to result in uptake of prevention services[2].

Objective #3 was to estimate the number of FSW living in Namibia – a difficult aim fraught with uncertainty and no gold standard against which to compare. Our study took the approach of using as many different methods as available to us and soliciting the input of experts, community members, and other stakeholders. A working consensus was reach for the numbers of FSW in the four cities and extrapolation to Namibia as a whole. Our best estimate is that there are 8,082 FSW in Namibia, which translates to 1.2% of the adult female population. This figure is is typical of estimates for sub-Saharan African countries[25]. Having a data-based number to work from provides realistic targets for the delivery of services to FSW in Namibia. Governmental and non-governmental programs can agree upon and be held accountable to performance measures such as the number of FSW reached by prevention programs, numbers tested, and numbers of HIV-positive FSW linked to care.

We also learned several other key features of the epidemiology of HIV among FSW in Namibia. A common finding was the high level of client and non-client sex partnerships among FSW in Namibia, with most having one or more non-client

partners (e.g., spouse, steady boyfriend, or casual partner) in addition to client sex-partners. HIV infection was significantly elevated among FSW with more client sex-partners, highlighting the high potential for transmission to and from their clients and other sex partners and the need for prevention programs to address both sexual risks. Independent of number of sex partners, HIV prevalence was elevated in FSW who were unemployed, currently out of school, and who had a lower level of education. Prevalence also consistently increased with increasing age in all sites, reflecting a cumulative risk over time. These risk factors identify specific points for prevention interventions and characteristics to target groups for HIV testing to identify new cases.

Finally, the results of the study highlight the need for new and combinations of prevention interventions for FSW. One new intervention with potential for HIV prevention among FSW is preexposure prophylaxis (PrEP). PrEP involves HIV-negative people taking ART to help prevent acquiring HIV infection. Several studies have shown PrEP to be safe, with minimal side effects, and effective in preventing HIV for some high-risk populations when taken on a daily basis[26] and can be combined with condoms and other prevention methods to provide greater protection than when used alone. Given the fact that PrEP is a relatively new prevention tool, awareness and demand in Namibia may be currently low. Therefore, formative research to assess awareness, acceptability, and potential barriers to PrEP use would be required prior to the successful implementation of a PrEP program among FSW.

7.2. Survey Limitations

No study is without limitations. We therefore highlight errors and potential biases that may affect interpretation of the results. First, although RDS surveys are held to approximate probability-based samples, and may be among the most robust methods available for hidden populations at this time, it is possible that certain sub-groups of FSW are not reached or well-represented due to how social networks are formed. Second, at present there is no gold standard or complete census of FSW against which to validate the IBBSS findings. Third, the IBBSS for FSW was conducted in only in four locations in Namibia, including major urban areas. Findings here may not apply to other urban areas of Namibia and the situation among FSW in rural areas and other hotspots may be different from the data presented here. Fourth, many of our results are based on self-reported responses of participants and may therefore be prone to response bias. For example, women may have overstated their condom use given the social desirability of that behavior. However, interviewers were trained to make participants feel comfortable in order to reduce social desirability bias and to ask probing questions to clarify seemingly inconsistent or incorrect responses in order to reduce recall bias. Finally, though we anticipate that the incentive offered in the study were modest enough to attract participants who are not FSW, we cannot totally exclude that some participants were not eligible and therefore may affect the true representation of the results.

7.3. Recommendations

High percentages of FSW with multiple client and non-client sex partnerships, combined with inconsistent condom use and low prevention program coverage suggest that HIV may be transmitted frequently within the FSW population and between FSW and the general population. A high proportion of HIV-positive FSW have not been previously diagnosed. However, the high ART coverage observed in this study among HIV positive FSW who were diagnosed suggests that universal eligibility “test-and-treat” programs could be successful if the frequency of HIV testing and counseling can be improved. Although provider-initiated testing and counseling strategies may reach a substantial proportion of FSW, alone they may no be sufficient and that enhanced community based approaches to HTC service delivery are urgently needed. Moreover, combination prevention strategies that address the diverse needs of FSW are needed. Based on IBBSS data, the MOHSS and its partners should consider:

- Establishing new and strengthening existing targeted interventions to reach FSW with frequent HTC services, including enhanced community-based approaches. Knowledge of serostatus, linkage to HIV care, and use of ART for suppression of viral load will dampen onward HIV transmission. These interventions should be urgently prioritized in Katima Mulilo where HIV prevalence is exceptionally high.

- Addressing factors associated with HIV infection among FSW – including lack of education or employment, multiple client and non-client sex partnerships, and in the case of Katima Mulilo physical abuse.
- Including FSW in the ongoing development of Namibia's combination prevention strategy and "test-and-treat" interventions.
- Implementing formative research to assess awareness, acceptability and potential barriers to PrEP use, which could lead to the development of PrEP interventions among this key population.
- Using the population size estimates to set targets for numbers of FSW to be reached by interventions to gauge coverage.

Success in implementing these recommendations and their impact on the HIV epidemic among FSW in Namibia can be measured in future rounds of IBBSS. We point to a final success of our efforts in the transfer of the technology of RDS to Namibia as an effective means to reach FSW in diverse contexts. The methodology can be adapted to deliver programs and reach other hidden populations at high risk, such as MSM and transgendered persons. We envision that future RDS surveys will play an important role demonstrating Namibia's success in "getting to zero new HIV infections" by showing that FSW have not been left out.

9. APPENDICES

Appendix 1: Formative Assessment Report
Appendix 2: Recruitment coupon
Appendix 3: IBBSS FSW Questionnaire

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