Republic of Namibia

Ministry of Health and Social Services

Results of the

Namibia Men's Health Study: Integrated Biological and Behavioral Surveillance Studies among Men who have Sex with Men in Namibia

September 2014

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PREFACE

The Ministry of Health and Social Services (MOHSS) is committed to collecting, interpreting and disseminating heatlh 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, interpreatation 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 Men's Health Study is 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 Men'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.

FORWARD

The Namibia Integrated Bio-behavioral Surveillance Studies (IBBSS) among Key Populations (KP) of 2012-2014 are the first of their kind to be conducted in Namibia. These surveys are intended to estimate the prevalence and correlates of HIV among groups thought to be at elevated risk for HIV acquisition, as well as to understand the extent to which they are benefiting from the country's multifaceted prevention, care and treatment response.

The IBBSS among men-who-have sex with men (MSM) was implemented in two phases. Phase one was conducted in Windhoek and Swakopmund/Walvis Bay from September 2012-August 2013; phase two was conducted in Keetmanshoop and Oshakati from October 2013-June 2014. A peer-referral method known as respondent driven sampling (RDS) was used to recruit participants. Participants completed behavioral questionnaires and received rapid HIV testing and counseling. Participants who tested positive for HIV were referred to care and treatment services. The survey recruited a total of 1,151 MSM in the four study sites.

The surveys estimated HIV prevalence to be 20.9% among MSM in Windhoek, 10.2% in Keetmanshoop, 10.2% in Walvis Bay and Swakopmund, and 7.1% in Oshakati. Each of these estimates is above the conventional 5% threshold to define a "kep population" at elevated risk for HIV. However, only the estimate for Windhoek exceeds the HIV prevalence among all adult males in the same region, as measured by the recently completed Namibia Demographic and Health Survey. Such findings may be optimistically interpreted that infection among MSM in Namibia has not yet risen to the high levels observed among MSM in much of the rest of the world and that an opportunity for prevention presents itself.

Results from this survey also highlight the need to strengthen targeted interventions to reach all MSM with frequent HIV testing and counseling (HTC) services, including enhanced community-based approaches to HTC service delivery, which will maximize knowledge of serostatus and facilitate linkage to HIV care. Furthermore, interventions that address risk factors associated with HIV infection among MSM- including older age, multiple male and female sex partnerships, and inconsistent condom use with male and female sex parnters- are urgently needed.

The MOHSS and its partners routinely conduct various HIV/AIDS research, surveillance and monitoring and evaluation activities in order to produce data that can be used to improve efficiency and effectiveness of our programs and interventions. This report of the IBBSS among MSM is intended to be used by different stakeholders at different levels of operation who are interested to learn more about the burden of HIV and the reach of prevention, care and treatment programs among KP, including MSM. I therefore encourage all stakeholders to familiarize themselves with the information and utilize it for planning and programmatic interventions.

Dr. Andreas Mwoombola
Permanent Secretary

PERMANENT SECRETARY
22 MAR 2017
REPUBLIC OF NAMIBIA
MINISTRY 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 men-who-have-sex-with men (MSM), may hinder control of the epidemic. Therefore, the Ministry of Health and Social Services (MoHSS) and key 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 MSM in Namibia in the cities of Keetmanshoop, Oshakati, Windhoek, and Swakopmund/Walvis Bay. 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 MSM population in each city. Core UNAIDS Global AIDS Response Progress Reporting (GARPR) indicators[1] and other results are presented in this Executive Summary and the body of this report.

1.2. Methods

A formative assessment period gathered key informant and stakeholder input on issues related to HIV among MSM in Namibia and on the logisitics of conducting surveys in this population in all four sites. The survey itself was implemented in two phases. Phase one was conducted in Windhoek and Swakopmund/Walvis Bay from Sep. 2012 – Aug. 2013; phase two was conducted in Keetmanshoop and Oshakati from Oct. 2013 – Jun. 2014. A peer-referral method known as respondent driven sampling (RDS) was used to recruit participants. Men who met all of the following criteria were eligible to participate: age 18 years or older; engaged in oral and/or anal sex with other men during the last six months; and resided in the study city for at least the past six months. Participants completed behavioral questionnaires and received rapid HIV testing and counseling. 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 in Keetmanshoop, Oshakati, and Swakopmund/Walvis Bay, the sites which conformed to the theory and practice of the sampling method. Due to non-progression of many recruitment chains in Windhoek, the RDS method did not conform to theory and results presented for this site are unadjusted.

1.3. Results

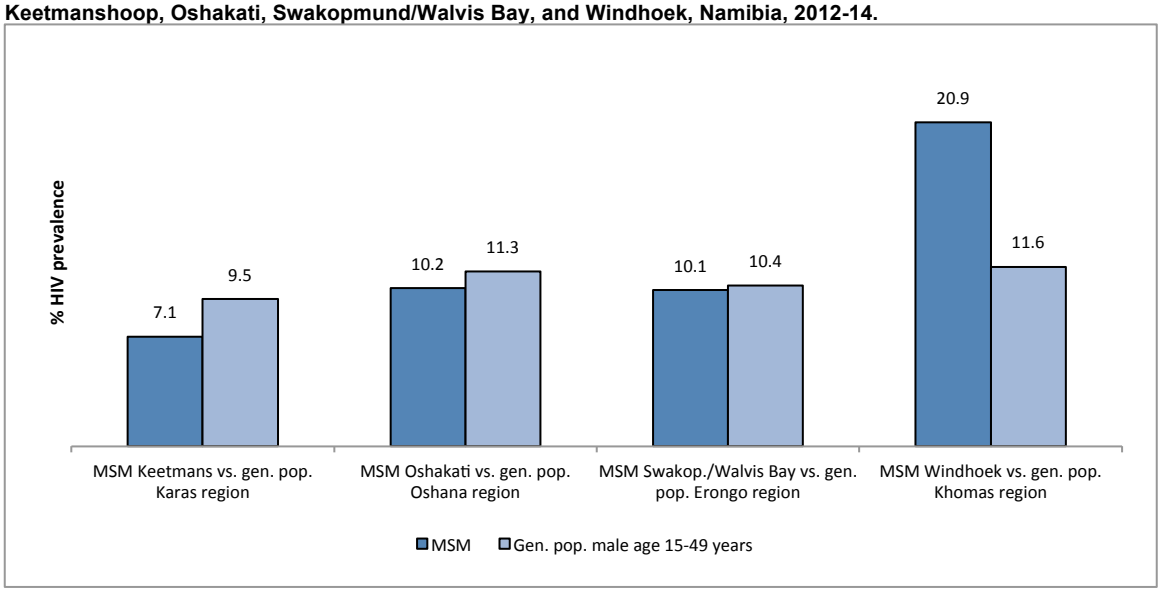
Recruitment

The Namibia IBBSS successfully recruited 1,151 MSM in the four study sites. The final sample included 316 MSM from Keetmanshoop, 194 from Oshakati, 320 from Swakopmund/Walvis Bay, and 321 from Windhoek. The majority of MSM in Keetmanshoop, Oshakati, and Windhoek were under age 25 years. The majority of MSM in Swakopmund/Walvis Bay were age 25 years or older.

HIV prevalence and associated risk factors

HIV prevalence among MSM was estimated to be 10.2% in Keetmanshoop, 7.1% in Oshakati, 10.1% in Swakopmund/Walvis Bay, and 20.9% in Windhoek **(Figure 1).** The estimated HIV prevalence among MSM in Oshakati and Swakopmund/Walvis Bay approximated that of the general population of adult males in the surrounding Oshana and Erongo regions, as measured by the Namibia Demographic and Health Survey, 2013.[2] HIV prevalence among MSM in Keetmanshoop was slightly lower than that of the general population of adult males in Karas region. HIV prevalence among MSM in Windhoek was nearly twice as high as HIV prevalence among adult males of the general population in Khomas region.

Figure 1. HIV prevalence among general population adult males by region * compared to HIV prevalence among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.



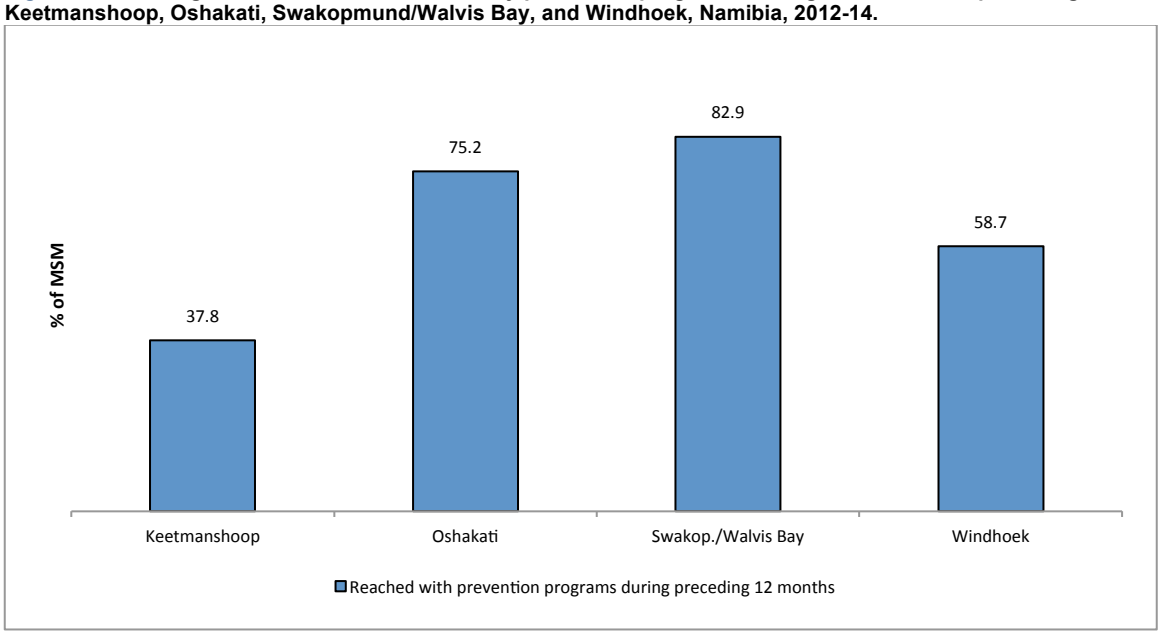
** HIV prevalence estimates as reported by The Namibia Ministry of Health and Social Services (MoHSS) and ICF International. 2014. The Namibia Demographic and Health Survey 2013. Windhoek, Namibia, and Rockville, Maryland, USA: MoHSS and ICF International.*

Risk factors associated with HIV infection varied by study site **(data shown in Sec. 6.3).** Among MSM in Keetmanshoop, older age, being out of school, and alcohol abuse were associated with increased probability of HIV infection. Among MSM in Oshakati, older age, symptoms or diagnosis of an STI during the twelve months preceding the IBBSS, and having a female sex partner during the twelve months preceding the IBBSS were associated with increased probability of HIV infection, while living outside of the study city area for any time during the twelve months preceding the IBBSS and circumcision were associated with a decreased probability of infection. Among MSM in Swakopmund/Walvis Bay, older age, having more female sex partners, and having more male sex partners were associated with increased probability of HIV infection. Among MSM in Windhoek, older age and having more male sex partners 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)

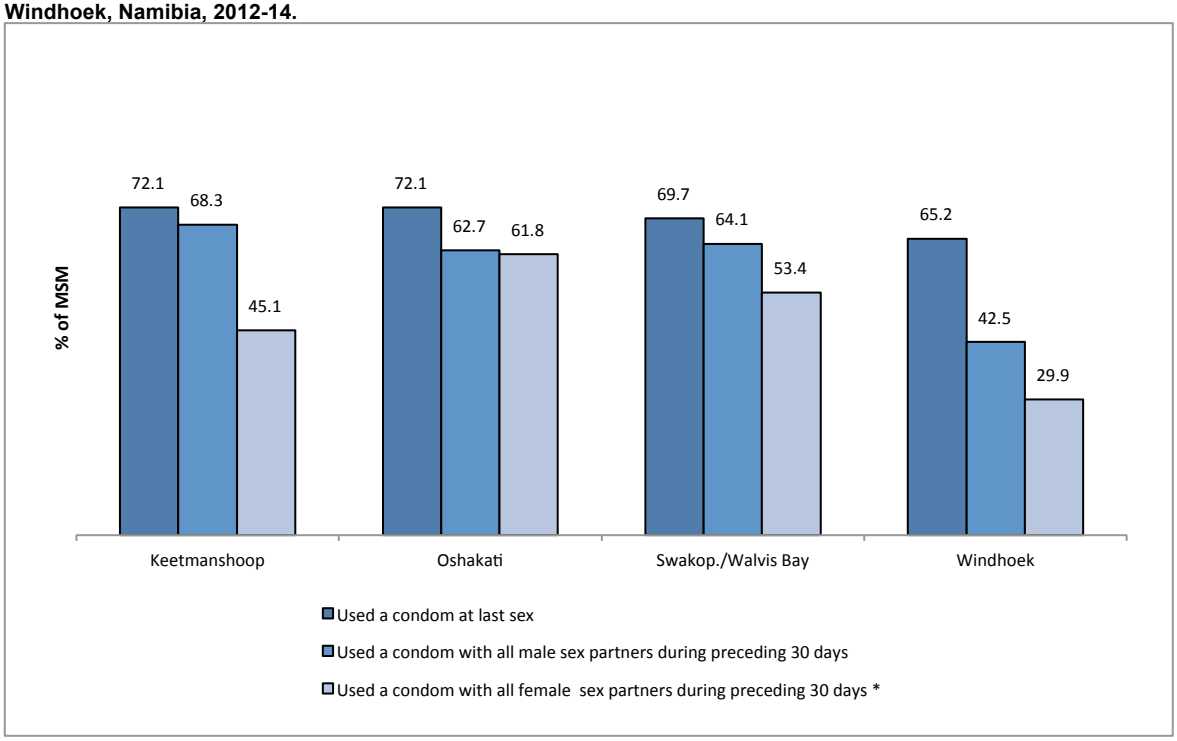
Among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, and Windhoek, 37.8%, 75.2%, 82.9%, and 58.2%, respectively, received an HIV prevention intervention **(Figure 2),** and 13.8%, 16.2%, 7.9%, and 11.2%, respectively, received HIV-related peer outreach during the during twelve months preceding the IBBSS. Among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, and Windhoek, 72.1%, 72.1%, 69.7%, and 65.2%, respectively, used a condom during the most recent time they had sex **(Figure 3)**. Consistent condom use in the last 30 days was higher with male partners than with female partners, also shown in Figure 3.

Figure 2. **Percentage of MSM who were reached by prevention programs* during twelve months preceding the IBBSS in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.**



** According to the UNAIDS GARPR indicator definition, an MSM was considered to be reached with prevention programs if he 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 male and female sex partners among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.**

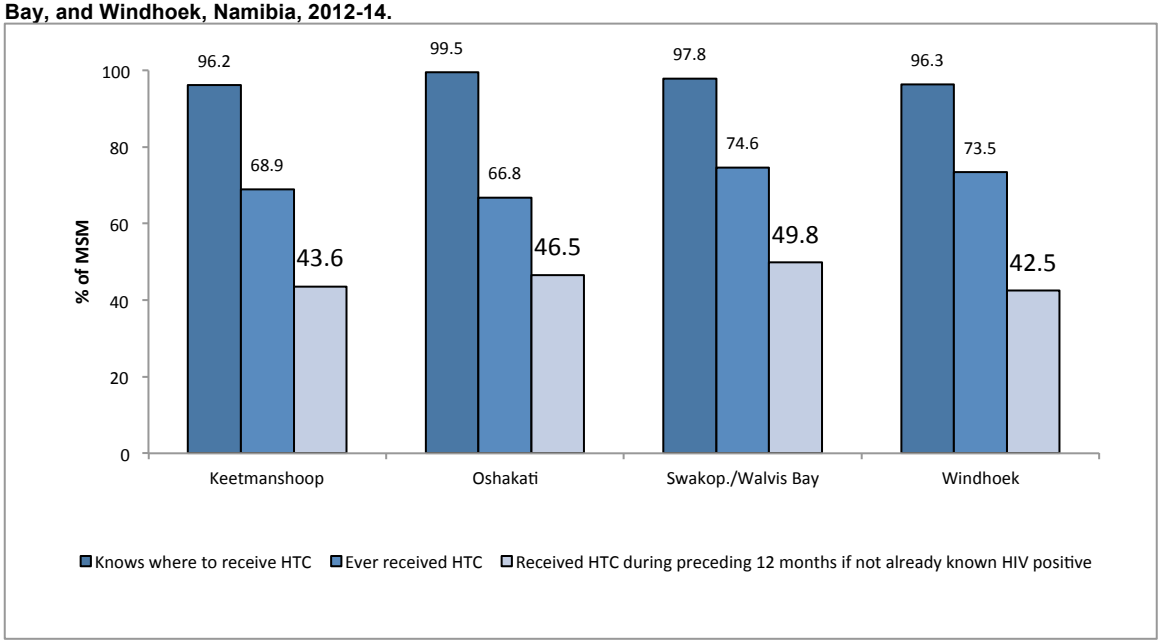


** Calculated only among those MSM who reported having a female sex partner in past 30 days*

The vast majority of MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, and Windhoek, knew where to receive HTC (96.2%, 99.5%, 97.8%, 96.3%, respectively), and two-thirds or greater had ever received HTC (68.9%, 66.8%, 74.6%, 73.5%, respectively) **(Figure 4)**. However, less than half were currently aware of their serostatus if not previously known to be HIV positive (43.6%, 46.5%, 49.8%, 42.5%, respectively). Only 30.3%,

38.8%, 36.3%, and 36.8% of MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, Windhoek, respectively, sought healthcare for any reason during the twelve months preceding the IBBSS, indicating limited opportunities for routine HTC for MSM within services.

Figure 4. Awareness and use of HIV testing and counseling services among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.



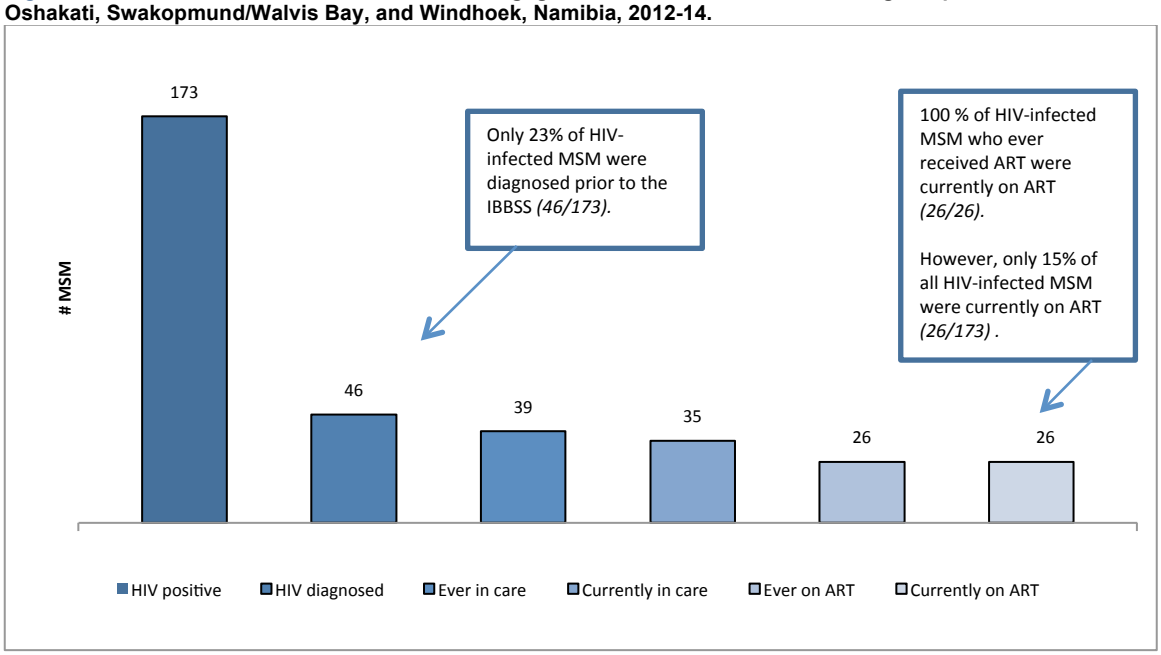
Sexual networks, bisexuality, and transactional sex among MSM

MSM in Namibia have both male and female partners, within stable and casual relationships, and within commercial and non-commercial contexts. These diverse sexual networks point to the high potential for HIV acquisition and onward transmission among MSM. The proportion of MSM with four or more male sex partners during the twelve months preceding the IBBSS in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, and Windhoek was 27.3%, 13.8%, 27.2%, 46.0%, respectively. A greater proportion had four or more female sex partners during the 12 months preceding the IBBSS: 53.4%, 43.4%, 39.8%, and 52.3%, respectively. Additionally, most MSM in Keetmanshoop, Swakopmund/Walvis Bay, and Windhoek reported that they were currently or formerly married or committed as if married to a woman (89.1%, 87.6%, and 56.6%, respectively). Payment for sex and receipt of payment for sex with both men and women was observed among MSM in all study sites, with the highest prevalence of transactional sex observed in Swakopmund/Walvis Bay and Windhoek.

Continuum of engagement in HIV care services among HIV positive MSM

Among the 173 HIV-positive MSM who participated in the IBBSS in all four study sites, 46 (26.6%) were aware of their HIV infection (i.e., previously diagnosed), 39 (22.5%) ever received care, 35 (20.2%) were currently in care, 26 (15.0%) had ever received ART, and 26 (15.0%) were currently receiving ART **(Figure 5).** With only 15.0% of HIV positive MSM currently on ART, the potential for onward transmission of infection to HIV negative sex partners is high. However, among HIV positive MSM who were aware of their infection, the level of engagement was high; 39/46 (84.8%) MSM who were diagnosed were linked to care; 35/39 (89.7%) MSM who were linked to care were retained in care; and 26/26 (100%) MSM 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. Despite the fact that engagement in the continuum of services after HIV diagnosis appears relatively high in all sites, the overall proportion of HIV-positive MSM on treatment was low. Lack of self-awareness of HIV serostatus appears to be the biggest gap in the continuum of service delivery.

Figure 5. Pooled estimates of the continuum of engagement in HIV care services among HIV positive MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, and Windhoek, Namibia, 2012-14.



MSM population size estimates

The number of MSM 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 concensus on the number of MSM age 18-49 years in Keetmanshoop was 500 (300 – 650) in Oshakati 500 (350 – 800), in Swakopmund/Walvis Bay 610 (475 -658), and in Windhoek 2,416 (850 – 4,000). Due to mobility, these figures may include MSM who permanently or temporarily reside in other areas. The stakeholders further extrapolated estimates to cover all of Namibia by applying urban and rural projections to the number of adult men. The total number of MSM in Namibia was estimated at 6,508 which corresponds to 1.0% of adult men, with a lower acceptable bound of 2,675 (0.4%) and upper acceptable bound of 17,815 (2.0%).

1.4. Conclusions and Recommendations

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

The surveys estimated HIV prevalence to be 20.9% among MSM in Windhoek, 10.2% in Keetmanshoop, 10.2% in Walvis Bay/Swakopmund, and 7.1% in Oshakati. Each of these estimates is above the conventional 5% threshold to define a "key population" at elevated risk for HIV. However, only the estimate for Windhoek exceeds the HIV prevalence among all adult males in the same region, as measured by the recently completed Namibia Demographic and Health Survey. Such findings may be optimistically interpreted to mean that infection among MSM in Namibia has not yet risen to the high levels observed among MSM in much of the rest of the world, and that an opportunity for prevention presents itself. Programs that are able to reach MSM with effective prevention messages and interventions now stand to avert many new infections. However, a less optimistic interpretation is that MSM communities in cities and towns in Namibia may be on their way to experiencing the higher HIV prevalence of MSM in Windhoek, and, if action is not taken soon, the long term will face a greater prevention challenge. In other words, 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 MSM.

HIV prevention is also challenged by the high percentages of MSM with multiple male and female sex partnerships, in commercial and non-commercial settings, combined with inconsistent condom use. The diversity of partners within their sexual networks suggest that HIV may be transmitted frequently within the MSM population and between MSM and the general population. Although not directly measured by the IBBSS, the high number of partners combined with different relationship types implies a potential for concurrency – a situation that can rapidly increase risk for onward HIV transmission along sexual networks.

Other key service use indicators among MSM in the Namibia IBBSS fall short of recommended targets.The majority of MSM are not accessing HTC services and are not aware of their HIV status, and many MSM are not using condoms consistently with both male and female sex partners. Although many MSM have been *"reached by prevention programs"* according to the GAPR definition, the majority have not received HIV- related peer or community based outreach, an approach recommended as an extraordinarily effective method of overcoming challenges related to accessing KP and increasing their uptake of prevention services.[3] Furthermore, an alarmingly high proportion of HIV-positive MSM had not been previously diagnosed. However, the high ART coverage, retention, and adherence rate following diagnosis observed among MSM in this study suggests that universal eligibility "test-and-treat" programs could successfully prevent onward transmission if the frequency of HTC can be increased. Infrequent health care use among MSM suggests that provider-initiated testing and counseling strategies alone may be insufficient and that enhanced community based approaches to HTC service delivery are urgently needed.

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

- Establishing new and strengthening existing targeted interventions to reach all MSM with frequent HTC services, including enhanced community-based approaches to HTC service delivery, which will maximize knowledge of serostatus, facilitate linkage to HIV care, use of ART, suppression of viral load, and dampening of onward HIV transmission among MSM and to their partners.
- Addressing risk factors associated with HIV infection among MSM – including older age, commercial and non-commercial multiple male and female sex partnerships, and inconsistent condom use with male and female sex partners – in the development of interventions and services.
- Inclusion of MSM in the ongoing development of Namibia's combination prevention strategy and "test-and-treat" interventions.
- Using the population size estimates to set targets for numbers of MSM to be reached by interventions to gauge coverage.

Success in implementing these recommendations and their impact on the HIV epidemic among MSM 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 MSM 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. A final caveat from the Windhoek MSM study site is that RDS may fail to meet the theoretical assumptions of RDS, and alternative sampling methodologies may be required among certain key populations. Nevertheless, we envision that future RDS surveys will play an important role in demonstrating Namibia's success in "getting to zero new HIV infections" by showing that MSM have not been left out.

2. LIST OF ACRONYMS

ANC	Antenatal clinic
ART	Antiretroviral therapy
CDC	U.S. Centers for Disease Control and Prevention
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
MSM	Men who have sex with men
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 an approximate population of just over 2 million persons sparsely distributed across 824,000 square kilometers, experiences a high, generalized, and mature epidemic with an estimated 14.3% of the adult population (age 15-49 years) infected with HIV. Differences in HIV prevalence in Namibia can be seen by age, gender, geography, and various risk factors.[4] An estimated 245,351 people in Namibia were living with HIV in 2013, with 59% of the positive adults 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.[5]

Although Namibia has a generalized epidemic classification, key populations may bear a disproportionate burden of disease. Key populations may also account for a relatively larger share of new infections and may transmit to other populations at lower risk. They may therefore represent an effective target group 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 Men who have Sex with Men (MSM) in Namibia

Internationally, there has been increased focus on the unmet HIV-related needs of MSM in low and middle income countries. A 2009 review highlighted that the HIV-related needs of MSM in sub-Saharan Africa are often overlooked even though prevalence among this population may be as high or higher than among adult men in the general population.[6] According to behavioral studies of MSM in Africa, unprotected anal sex is more common than previously assumed, or knowledge and access to appropriate risk reduction interventions is inadequate.[6]

A 2009 study of 218 MSM in Windhoek found an HIV prevalence of 12.4% in the sample.[7] The mean age of MSM was 24.4, 10.3% had concurrent regular male and female partners, and 44.5% had disclosed their sexual orientation to their family. Over half (51%) of MSM reported having sex with both men and women in the last 6 months. Only 3.3% of MSM practiced safe anal sex (always used a condom and water-based lubricant) and 27.0% of MSM exchanged anal sex for gifts with other men.[7]

MSM in Namibia seem to have limited access to necessary health services, with the 2009 study indicating that 18.3% reported being afraid to seek health services and 8.3% reported being denied health care based on their sexuality.[7] This coincides with a separate 2009 needs assessment conducted by a local community-based lesbian, gay, bisexual, transgender, and intersex (LGBTI) organization (The Rainbow Project), which found that 62% of LGBTI respondents felt that healthcare workers discriminate against homosexuals. This was a reason why most LGBTI (92.1%) respondents of the needs assessment seek voluntary counseling and testing services in the private sector. Fourteen percent of LGBTI self-reported being HIV positive in the assessment but only 6.6% received follow-up HIV care.[8]

3.3. Study justification

Limited data exist in Namibia on the characteristics, population size, HIV prevalence, and health-seeking and HIV risk behaviors of MSM, as detailed in the report of the 2009 Namibia Triangulation Project.[9] The Trianguational report identified a gap in understanding HIV risk behaviors among MSM which needs to be addressed to assist in the implementation of targeted prevention, care, and treatment interventions. Existing studies mainly focus on MSM in Swakopmund, Walvis Bay, and Windhoek with limited or non-existent data for most other parts of the country. To fill this gap, the Namibia MoHSS in collaboration with the U.S. Centers for Disease Control and Prevention (CDC) Division of Global HIV/AIDS offices in Namibia and Atlanta, who provided financial and technical support, and the University of California, San Francisco (UCSF), as the technical assistance provider, implemented a series of Integrated Biological Behavioral Surveillance Surveys (IBBSS) with population size estimation to better understand the prevention, care, and treatment needs of MSM and to provide data needed to develop programs focused towards this population.

3.4. Study goal

The overall goal of the Namibia IBBSS among MSM was to gather in-depth data that can be used to better understand the burden of HIV disease among MSM and HIV related risk, prevention, and heath-seeking behaviours. The IBBSS was designed to provide information that will ultimately be used to develop appropriate prevention, care, and treatment interventions. Estimation of the MSM population sizes is intended to provide program staff and policy makers more information on the scope of the HIV epidemic, which will assist them in planning appropriate interventions and allocating sufficient resources. Multiple size estimation methods were implemented to triangulate results from different data sources, as recommended by UNAIDS guidelines on size estimation of most-at-risk populations.[10]

3.5. Study objectives

The primary objectives of the Namibia IBBSS among MSM were to:

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

4. METHODS

To achieve the study objectives, 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 was designed to include two major interlinked components: a formative assessment stage to inform the design of the second stage - integrated biological-behavioral surveillance surveys in targeted geographic areas.

4.1. Formative assessment

To inform the development of the survey protocol and its implementation, a formative assessment was conducted in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, and Windhoek during a three-week period prior to the IBBSS survey implementation stage. Data from the formative assessment was used to inform the selection of respondent-driven sampling (RDS) as the most effective sampling method, study site locations, incentives, and components of the behavioral questionnaire. The assessment used qualitative methods and tools common to ethnographic studies, including key informant interviews, focus group discussions, observation, and ethnographic mapping.

4.2. Respondent-Driven Sampling (RDS) overview

Respondent-driven sampling (RDS) is a social network-based sampling method that has been used in many settings to overcome the problem of achieving scientifically sound samples of marginalized or hidden populations such as MSM.[11-13] RDS may not be appropriate among all populations. 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, ultimately that sufficient cross-group recruitment according to characteristics such as age, sex, or outcome variable occurs 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.

The RDS methodology was initiated with a purposely chosen set of 6-9 initial "seeds" from each of the four study sites who were diverse with regards to marital status, sexual identity, engagement in sex work, age, employment or student status, income, and having known access to MSM-friendly services. They were known members of the MSM population who were instructed to recruit a limited number of other MSM from their social network, who in turn were enrolled (if found eligible) and instructed to recruit other MSM peers, and so on. In some study sites, additional seeds were added in response to low levels of recruitment from 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 make up 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 link who recruited whom (needed for statistical adjustment) through the use of codes (coupon numbers). RDS Coupon Manager (RDSCM) software version 3.0 and a manually completed log book were used to document and analyze the recruitment links. Being in possession of a valid coupon was an eligibility criterion for this survey. 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 MSM 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

IBBSS participants were reimbursed N$100 for transportation costs and given a non-monetary primary incentive package consisting of a non-perishable snack and juice, condoms, lubricant, and a small size cologne for completing the study. In addition, participants were provided with a N$20 phone voucher as secondary incentive for each successful recruit. The study was conducted anonymously in its entirety; no identifying information such as names or addresses were ever asked or recorded. To ensure confidentiality, participants' coupons, questionnaires, specimens, and test results were identified using participant ID numbers. The IBBSS was conducted in four urban areas, Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, and Windhoek. These cities were selected because stakeholders believed that they account for the largest MSM networks in Namibia. It was also believed that these areas had a geographical and cultural diversity and enough MSM to obtain the required sample size. The surrounding metropolitan areas of each city were also included as part of the survey in order to improve coverage of the target population. The feasibility of RDS in all study sites was confirmed during the formative assessment.

In the specific case of Walvis Bay, the nearby coastal city of Swakopmund, at a distance of 30 km away, was considered as part of the same geographical area based on data from the formative assessment, which showed that social networks of MSM in both cities were interconnected. Similarly, the nearby cities of Ondangwa and Ongwediva were considered as part of the same geographical area as the Oshakati study site. The region of Karas, where Keetmanshoop is located, was considered as part of the same geographical area as the Keetmanshoop city study site.

Discrete study offices in each of the four RDS sites above were identified and selected based on findings from the formative assessment and on several factors, including: accessible to the largest and most diverse group of MSM, nearby public transportation, easy to give directions for and easy to locate based on nearby landmarks, not easily identifiable to the general public, and not too secluded to be unsafe.

4.4. Eligibility criteria

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

- At least 18 years of age

- Biologically male
- Able to speak English, Oshiwambo, or Afrikaans
- Engaged in anal and/or oral sex with a man in the last six months
- Residence in study area for at least six months

Additionally, men who had previous participation in the survey (in any of the cities) or who were unable to provide informed consent (e.g., 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 MSM 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 between successive IBBS rounds. In this study, 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 MSM 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 use with anal intercourse at an estimated 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%) or decrease (to 55%) based on the ability to assess meaningful program effort between surveys.

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

$Z1\text{-}\alpha$ = the z-score corresponding to the 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 between survey waves produced needed sample sizes of 268 MSM 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

All IBBSS participants gave verbal informed consent prior to participation. Eligible recruits read or had read to them the verbal informed consent information sheet in English, Oshiwambo, or Afrikaans with the opportunity to have any questions answered by the interviewer. Participants were not required to sign the consent forms because the signed consent form would have been the only link between the participant and the study. The verbal informed consent information sheet allowed for separate consent for different components of the study including completion of the questionnaire and HIV rapid testing.

4.7. Behavioral data collection

Behavioral data were collected using a standardized questionnaire based on behavioral surveillance surveys implemented in MSM populations in other countries, but adapted to the Namibia MSM context. The questionnaire included questions that would inform national and international indicators related to the response to the HIV epidemic (e.g., UNAIDS Global indicators) and to allow for specialized analysis of RDS data. The topics of the questionnaire included demographic data, behaviors potentially related to HIV infection and other STIs, discrimination, access and use of HIV prevention, care, and treatment, and other health services. Each participant answered questions about the size of their social network. The personal social network size reported by each participant was used to calculate weights for each participant's data, allowing for point estimates and 95% confidence intervals that are, in theory, representative of the underlying population. The full survey questionnaire can be found in **Appendix 1**: **Questionnaire**.

The questionnaire was developed in English and first tested and reviewed by study investigators and study staff during formative assessment. It was pilot tested in the population and by survey staff during training before implementation. Namibian study staff fluent in local languages administered the behavioral questionnaires to participants in Afrikaans and Oshiwambo 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 netbook computer.

4.8. Laboratory procedures

Serological testing for markers of HIV used Namibia MoHSS-approved assays following standardized protocols. Testing occurred after consent, after the questionnaire, and after pre-test counseling by rapid testing at the study sites by certified study staff. HIV antibody status was determined using a parallel algorithm based on the national protocols. Persons testing positive for HIV were given further counseling with referral to care services for repeat counseling and testing. All HIV testing procedures were supervised by site supervisors, who were nurses also certified in rapid testing and quality control. Waste disposal standards were adhered to for biological testing procedures.

Quality Assurance of 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 client sample at the NIP laboratory using a standard of care fourth generation ELISA.

4.9. Procedures for population size estimation

No gold standard method to determine the true size of the MSM population currently exists. Therefore, five different population size estimation methods were used and synthesized in the current study. These included: 1) key informant estimates, 2) census mapping with enumeration, 3) literature review during the formative phase, 4) unique object multiplier and 5) "wisdom of the crowds" methods during the survey itself. After the completion of the IBBSS, a population size estimation stakeholders meeting was held and a modified Delphi approach was used to synthesize the estimates from the five size estimation methods and incorporate the local knowledge of the key population stakeholders. A description of each method is provided below.

Key Informant size estimation method

The key informant method assumes that individual members of the group have unique information concerning the population size. The key informants may also include other informed stakeholders, such as service providers. In the approach, the key informants are asked to estimate or guess the number of MSM in the city. We used the median response, the 25th percentile, and 75th percentile as the point estimate, lower acceptable bound, and upper acceptable bound, respectively.

Census mapping and enumeration method

The census mapping and enumeration method was conducted as part of the formative assessment stage. The method estimated the population size of MSM by first mapping the venues of 'hotspots' where MSM congregate and find sex partners based on key informant reports. The research field team then went to each venue and

counted the number of MSM present. This 'head count' was summed across all venues or hotspots mapped in the particular geographic areas to obtain an estimate of the population size. Because this method depends on the visibility of MSM, these estimates are likely an undercount of the true population size.

Literature review size estimation method

In the literature review size estimation 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 males estimated to be MSM in these other studies was then applied to the adult male population in the Namibian study locations, obtained from the census, to estimate the number of MSM.

Unique-object multiplier size estimation method

The unique-object multiplier[10] 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 all experienced a particular event. The second sample is a representative sample of the target population. The proportion of the second sample that 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 number of torches distributed was divided by the proportion of MSM 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[14] 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 MSM 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[10] 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 and the final population size estimation results of the IBBSS. IBBSS size estimation results were than extrapolated by stakeholders to produce MSM 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, the IBBSS field staff received a two-week training which focused on general knowledge of MSM in the world and sub-Saharan Africa, ethical issues in human subject research, and standard operating procedures for survey implementation using RDS. The training included theory as well as practical exercises simulating survey procedures and 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 conducting HIV rapid testing 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

During the questionnaire administration, data 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. All 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)[15] was used to produce point estimates and 95% confidence intervals of the demographic and risk behavior variables and HIV prevalence in each study site. In RDSAT, the number of re-samples for bootstrap was set to 150,000 and the algorithm type set as "enhanced data-smoothing." RDS network size of each participant was determined by the following question: *"Approximately how many other men who have sex with men 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 risk variables. Candidate variables were selected for inclusion in the bivariate models if they were assumed to have potential utility for establishing risk-profiles 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 ≤ 0.1 (borderline significant).

Recruitment network figures were created using Graphviiz software package.

In the case of the Windhoek survey, RDSAT adjustments were not done for theoretical and practical reasons. First, a large number of the purposely selected seeds in Windhoek did not recruit other MSM. This resulted in violation of the theoretical assumption that participants are randomly recruited from the social networks of their peers (i.e., many were selected by the researchers in this case).[11, 16] Second, a large proportion of participants who were recruited by seeds did not recruit others; thus, the assumption that the entire population can be reached through one long chain of referrals was violated. Third, the short chains meant there was insufficient cross-group recruitment to adjust for differential probability of being included in the sample and to account for similarities of persons within their social networks. These three theoretical assumption violations also resulted in two practical limitations to analysis in RDSAT: that 95% confidence intervals were incalculable when no cross-recruitments occurred, or were uninterpretable when few cross recruitments occurred (e.g., the 95% CI spanned from 0% - 100%). For these limitations, the data from Windhoek is presented as crude only (unadjusted). The reader is cautioned to consider the Windhoek survey as a convenience sample which, although diverse in some aspects, does not conform to the statistical basis of RDS as do the other surveys.

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 San Francisco, USA, which serve as the institutional review boards for human subjects research. The protocol was also reviewed by the CDC office in Namibia and at the CDC Center for Global Health in Atlanta, USA. All 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 consisting of a non-perishable snack and juice, condoms, lubricant, and a small size cologne 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 deemed modest enough by key informants and the IRBs that they would not 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 MSM minors involved in sex work were identified by the investigators in each of the study sites.

6. RESULTS

6.1. Summary of IBBSS recruitment, eligibility, and enrollment

6.1.1. Recruitment

IBBSS recruitment was conducted from September 2012 to August 2013 in Walvis Bay/Swakopmund and Windhoek (45 weeks) and from October 2013 to June 2014 in Keetmanshoop and Oshakati (37 weeks).

Seven seeds were identified in the Keetmanshoop site; one was ineligible; and six contributed to the recruitment of participants. Of the six seeds who referred participants, one seed initiated the recruitment of 272 participants (86.4% of the total). The maximum number of recruitment waves in Keetmanshoop was 19.

Nine seeds were identified in the Oshakati site; seven contributed to the recruitment of participants; one was ineligible; and one was unproductive. Of the seven seeds who referred participants, two initiated the recruitment of 139 participants (72.6% of the total). The maximum number of recruitment waves in Oshakati was 14.

Initially nine seeds were identified in Swakopmund/Walvis Bay site, but only four successfully recruited participants. One seed initiated recruitment to seven waves while the others' chains stopped at wave three. Due to the slow pace of recruitment, an additional 42 seeds were planted across the remaining weeks of the study. From the total of 51 seeds, 19 led to the recruitment of other participants. Of the 19 seeds who referred participants, one chain led to 97 recruits (30.6 % of the total sample). The maximum number of recruitment waves in Swakopmund/Walvis Bay was nine.

Six seeds were initially identified in the Windhoek site. Due to the slow pace of recruitment, an additional 96 seeds were included of whom 24 led to any recruitment. The maximum number of recruitment waves in Windhoek was five.

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. Red coloring indicates that the participant (whether seed or recruit) was age 18-24 years and blue 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 edge of the diagrams. As can be seen in the diagrams, the age of participants in Keetmanshoop, Oshakati, and Swakopmund/Walvis Bay diversified throughout the recruitment process (i.e., participants 25 years old and older recruited within the same age group and also those 18–24 years old, and vice versa). Equilibrium was broadly achieved on the key variables tracked through recruitment waves, namely age, education, student status, marital status, sex with women, sex for money, contact with peer educators, HIV testing, and HIV serostatus. For example, equilibrium was achieved on age after three, two, and three waves of recruitment in Keetmanshoop, Oshakati, and Swakopmund/Walvis Bay, respectively. Additionally, the diagrams show that the majority of respondents successfully recruited and were recruited by peers within their own social network. However, patterns of recruitment differed in Windhoek where a large part of the sample was comprised of selected seeds and short recruitment chains. Although a similar age-based diversification of the sample can be seen over advancing waves of recruitment, the majority of seeds in Windhoek failed to produce multiple waves of recruitment and many new seeds were subsequently planted. This suggests that a large proportion of respondents were not randomly recruited by peers within their own social network and that equilibrium on key variables was not achieved. As discussed in **Section 4.12** above, this violation is one reason for not conducting the RDSAT adjustments to the Windhoek data and to exercise caution when interpreting the data from this site beyond being a convenience sample.

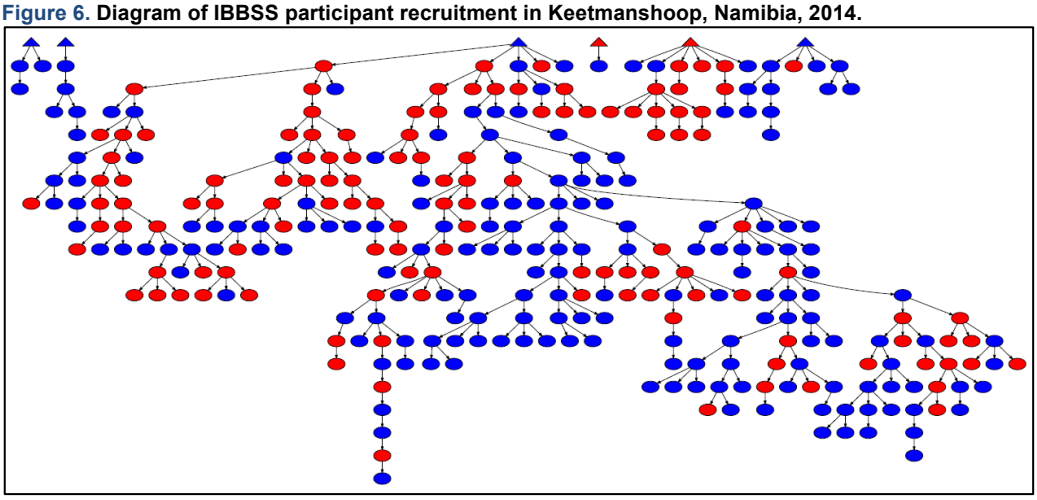
6.1.2. Summary of eligibility and survey enrollment

A total of 928, 545, 1,711, and 1,069 coupons were distributed in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, and Windhoek, respectively. Of the coupons distributed, 456 (49.1 %), 293 (53.7 %), 406 (23.7 %), and 372 (34.8 %) coupons were returned by potential participants to the study sites in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, and Windhoek, respectively. The eligibility rate (i.e., number of participants screened eligible / the number of coupons returned by potential participants) was 69.3%, 66.2 %, 78.8 %, and 86.3 % in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, and Windhoek, respectively.

The most common reasons for ineligibility in each of the four study sites was *not having sex with a man in the 12 months preceding the IBBSS* or *not being MSM.* Other common reasons for being ineligible were; *being under the age of 18 years*, *being drunk or high 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*.

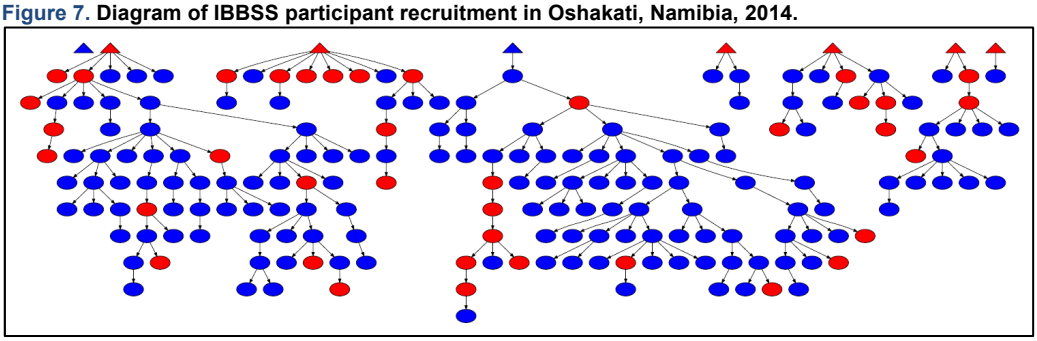
The final sample size was 316 in Keetmanshoop, 194 in Oshakati, 320 in Swakopmund/Walvis Bay, and 321 in Windhoek.

Figure 6. Diagram of IBBSS participant recruitment in Keetmanshoop, Namibia, 2014.



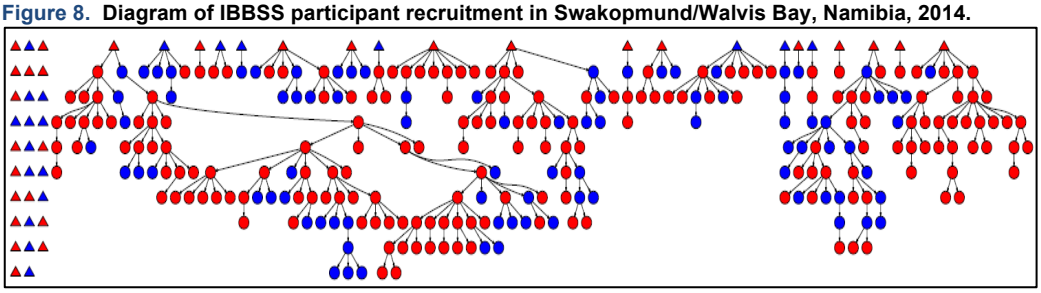
^ Seeds are represented by triangles with black arrows that point outwards to recruits. Circles represent recruits. Red coloring indicates that the participant (whether seed or recruit) was age 18-24 years and blue coloring indicates that the participant was age ≥ 25 years. Seeds who failed to recruit any participants do not have attached arrows and are positioned on the extreme left or top edge of the figure.

Figure 7. Diagram of IBBSS participant recruitment in Oshakati, Namibia, 2014.



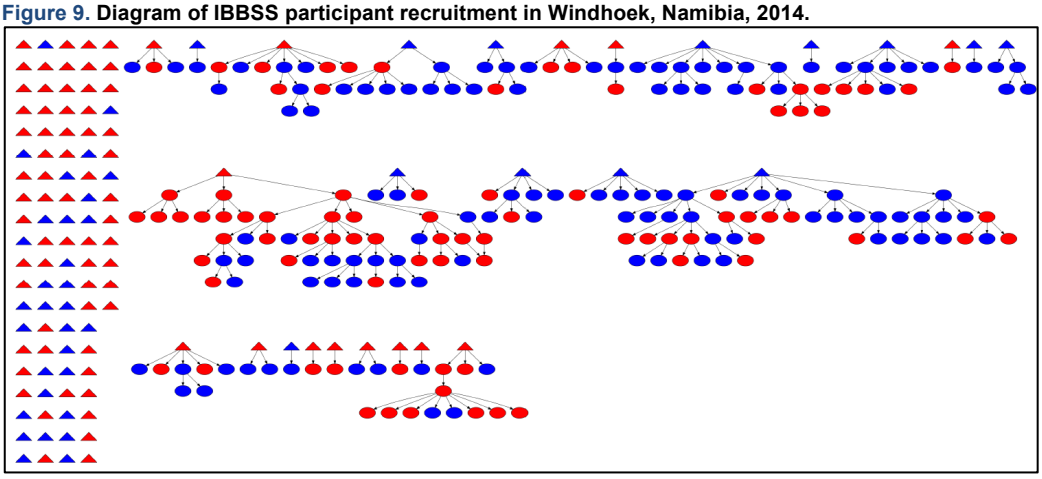
^ Seeds are represented by triangles with black arrows that point outwards to recruits. Circles represent recruits. Red coloring indicates that the participant (whether seed or recruit) was age 18-24 years and blue coloring indicates that the participant was age ≥ 25 years. Seeds who failed to recruit any participants do not have attached arrows and are positioned on the extreme left or top edge of the figure.

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



^ Seeds are represented by triangles with black arrows that point outwards to recruits. Circles represent recruits. Red coloring indicates that the participant (whether seed or recruit) was age 18-24 years and blue 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 figure.

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



^ Seeds are represented by triangles with black arrows that point outwards to recruits. Circles represent recruits. Red coloring indicates that the participant (whether seed or recruit) was age 18-24 years and blue 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 figure.

6.1.3. HIV rapid testing refusal

HIV results of seven participants in Oshakati, seven in Swakopmund/Walvis Bay, and 33 in Windhoek were not available because these participants did not give their consent for rapid testing. All participants from Keetmanshoop agreed to the HIV rapid test. 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 describe MSM in the four study sites according to select demographic characteristics and HIV risk behaviors. RDS adjusted results are presented for MSM in the Keetmanshoop, Oshakati, and Swakopmund/Walvis Bay study sites; crude (i.e., not adjusted) results are presented for MSM in the Windhoek study site.

Demographic characteristics of MSM

Table 6.2.1 describes the distribution of age and religious affiliation among MSM in the four study sites. The majority of MSM were 20-24 years old in all four sites. More than 95% of MSM in Keetmanshoop, Oshakati, and Swakopmund/Walvis Bay, and 86.3% of the MSM in Windhoek reported "Christian" as their religious affiliation.

Table 6.2.1. Age and religious affiliation among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

	Keetmanshoop		Oshakati		Swakop./Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**Crude % (95% CI)**
Age group								
18-19 years	37	12.2 (5.8 - 19.9)	55	26.6 (17.6 - 34.7)	20	13.2 (5.7 - 17.8)	41	12.73 (9.5 - 16.9)
20-24 years	152	50.2 (40 - 62)	95	56.4 (47.2 - 67.4)	87	34.9 (26.3 - 44.8)	123	38.2 (33.0 - 43.7)
25-29 years	42	8.6 (4.9 - 13.2)	31	14.1 (6.4 - 22.7)	87	25.0 (16.9 - 34.3)	82	25.5 (21.0 - 30.5)
≥ 30 years	85	29.0 (17.1 - 40.4)	13	2.9 (0.9 - 5.4)	125	26.9 (19.4 - 38.0)	76	23.6 (19.3 - 28.6)
Religious affiliation								
Christian	301	98.6 (95 - 99.8)	190	97.9 (95.3 - 99.7)	310	98.7 (97.2 - 99.8)	278	86.3 (82.1 - 89.7)
Other or none	15	1.4 (0.2 - 4.9)	4	2.1 (0.3 - 4.7)	8	1.3 (0.2 - 2.8)	44	13.7 (10.3 - 17.9)

The majority of MSM in Keetmanshoop, Oshakati, and Windhoek were not current students at the time of enrollment in the IBBSS (**Table 6.2.2).** In contrast, 70.4% of MSM in Oshakati were current students at the time of enrollment. Across study sites, the majority of MSM completed either grade ten or grade twelve as their highest level of education. More MSM in Windhoek completed tertiary education (13.8%) than MSM in other sites. The majority of MSM in Keetmanshoop and Swakopmund/Walvis Bay (68.8% and 69.4%, respectively) reported that they had some form of employment during the twelve months preceding the IBBSS. In contrast, the majority of MSM in Oshakati and Windhoek (53.3 % and 67.1%, respectively) reported that they had no employment during the twelve months preceding the IBBSS.

Most MSM in Keetmanshoop and Swakopmund/Walvis Bay, and Windhoek reported that they were currently or formerly married or committed as if married to a woman (89.1% and 87.6%, and 56.6%, respectively) **(Table 6.2.2).** Marital status-based distributions in Oshakati are more varied relative to other sites; 29.7% of MSM there have never been married, 38.2% were married or committed as if married to a woman, and 32.1% were married or committed as if married to a man.

Table 6.2.2. Educational level, employment and mobility among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

	Keetmanshoop		Oshakati		Swakop./Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**Crude % (95% CI)**
Student Status								
Currently a student	40	13.1 (5.4 - 24.4)	126	70.4 (59.5 - 80.6)	52	19.4 (12.4 - 27.2)	92	28.7 (23.7 - 33.6)
Currently not a student	276	86.9 (75.5 - 94.6)	68	29.6 (19.5 - 40.4)	266	80.6 (72.9 - 87.6)	229	71.3 (66.4 - 76.3)
Highest level of education completed								
Primary or less	64	21.6 (13 - 29.3)	6	2.5 (0.4 - 5.1)	21	7.8 (2.7 - 11.4)	28	8.8 (5.6 - 11.9)
Grade 10	149	41.9 (31.3 - 52.2)	45	27.5 (17.2 - 38.3)	157	53.9 (46.5 - 63.2)	126	39.4 (34.0 - 44.8)
Grade 12	96	35.9 (25.8 - 49.1)	121	64.2 (53.7 - 75.2)	130	36.4 (28.6 - 43.9)	122	38.2 (32.8 - 43.8)
Tertiary	7	0.6 (0 - 1.5)	22	5.8 (2 - 10.5)	11	1.9 (0.3 - 5.0)	44	13.8 (10 - 17.5)
Employment status								
Employed at any time during 12 months preceding the IBBSS	264	68.8 (58.6 - 79.5)	98	46.7 (37.7 - 58.9)	223	69.4 (63.2 - 78.9)	106	32.9 (27.8 - 38.1)
Not employed at any time during 12 months preceding the IBBSS	52	31.2 (20.8 - 41.6)	96	53.3 (41.2 - 62.2)	96	30.6 (21.1 - 37.0)	216	67.1 (61.9 - 72.2)
Mobiltiy								
Lived away from study site at any time during 12 months preceding the IBBSS	128	62.0 (51.5 - 71.5)	90	46.3 (36 - 57.4)	190	69.3 (59.8 - 77.4)	113	35.1 (29.9 - 40.3)
Did not live away from study site at any time during 12 months preceding the IBBSS	188	38.0 (28.2 - 48.8)	104	53.7 (42.8 - 64)	129	30.7 (22.6 - 40.2)	209	64.9 (59.7 - 70.1)
Marital status								
Never married or committed as if married	17	5.5 (2.1 - 10.1)	61	29.7 (20.3 - 39.1)	48	6.9 (3.9 - 11.6)	115	35.9(30.7 -41.2)
Currently/ formerly married or committed as if married to a woman	293	89.1 (81 - 95.6)	81	38.2 (28.3 - 48.9)	254	87.6 (82.6 - 92.8)	181	56.6 (51.1 - 62.0)
Currently/ formerly married or committed as if married to a man	6	5.4 (0.1 - 13.1)	51	32.1 (22.5 - 42.7)	17	5.5 (1.4 - 8.5)	24	7.5 (5.0 - 10.4)

Sexual history and recent sexual behaviours with other men among MSM

More than 90% of MSM in each of the four study sites reported that they ever had anal sex with another man (**Table 6.2.3)**. The majority of MSM in Keetmanshoop, Oshakati, and Windhoek reported that they first had anal intercourse with another man prior to age 20 years**.** In contrast, the majority of MSM in Swakopmund/Walvis Bay (59.1%) first had anal sex with another man after they were ≥ 20 years old.

Having multiple male partnerships and commercial partnerships in the preceding 12 months was common. Among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, 36.6%, 50.0%, 37.9%, and 20.8%, respectively, had only one male anal sex partner; 34.7%, 36.2%, 31.1%, and 32.6%, respectively, had two to three male anal sex partners; and 27.3%, 13.8%, 27.2% and 46.0%, respectively, had four or more male anal sex partners during the twelve months preceding the IBBSS. The proportion of MSM in the four study sites who received payment in exchange for sex with a man in the twelve months preceding the IBBSS ranged from 37.1% (Oshakati) to 46.1% (Windhoek). The proportion of MSM in the four study sites who paid a man for sex in the twelve months preceding the IBBSS ranged from only 6.6% (Oshakati) to 14.0% (Windhoek).

Table 6.2.3. Sexual history and recent sexual behavior with other men among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

	Keetmanshoop		Oshakati		Swakop./Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**Crude % (95% CI)**
Ever had anal sex with a man	314	98.9 (95.5 - 100)	188	96.4 (92.7 - 99.3)	307	93.7 (87.6 - 98.5)	313	97.2 (95.4 - 99.0)
Age at first anal sex with a man *(among MSM who ever had anal sex with a man)*								
< 15 years	24	3.9 (1.3 - 8)	13	5.9 (1.6 - 12.1)	22	5.8 (2.5 - 11.8)	42	13.4 (9.6 - 17.2)
15-19 years	167	56.8 (45.9 - 66.4)	108	47.5 (35.8 - 58.2)	105	35.0 (25.0 - 44.2)	149	47.6 (42.0 - 53.1)
≥ 20 years	123	39.3 (29.6 - 50.7)	67	46.6 (35 - 59.2)	180	59.1 (48.9 - 69.5)	122	39.0 (33.6 - 44.4)
Number of male anal sex partners during 12 months preceding the IBBSS								
none	1	1.5 (0 - 4.9)	0	0 (- -)	5	3.8 (0.0 - 8.2)	2	0.6 (0.0 - 1.5)
1	58	36.6 (24.4 - 47.8)	81	50.0 (40.1 - 60)	109	37.9 (29.6 - 47.8)	67	20.8 (16.4 - 25.3)
2 to 3	111	34.7 (25.4 - 44.8)	71	36.2 (26.5 - 45.9)	106	31.1 (23.4 - 39.3)	105	32.6 (27.5 - 37.8)
≥ 4	146	27.3 (19.7 - 37.1)	42	13.8 (8.7 - 19.8)	99	27.2 (18.8 - 36.8)	148	46.0 (40.5 - 51.4)
Received money, goods or services for sex from a man during 12 months preceding the IBBSS	104	39.4 (30.4 - 50.9)	71	37.1 (26.6 - 47.2)	119	43.6 (33.7 - 54.2)	167	46.1 (40.5- 51.7)
Paid money, goods or services for sex to a man during 12 months preceding the IBBSS	18	7.3 (2.1 - 15.2)	15	6.6 (2.9 - 11.5)	38	12.5 (7.4 - 18.5)	41	14.0 (10.3 - 18.1)

The majority of MSM in each of the study sites reported that they had ever had vaginal sex with a woman **(Table 6.2.4)**. Most MSM had their first sexual encounter with a woman between the ages of 15 and 19 years (76.9%, 60.3%, 65.9%, and 63.2% in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, and Windhoek, respectively). Approximately half of the MSM in each of the study sites had four or more female sexual partners during the 12 months preceding the IBBSS. The proportion of MSM in the four study sites who received payment in exchange for sex with a woman in the twelve months preceding the IBBSS ranged from 17.2% (Oshakati) to 24.6% (Swakopmund/Walvis Bay). The proportion of MSM in the four study sites who paid a woman for sex in the twelve months preceding the IBBSS ranged from 12.1% (Keetmanshoop) to 35.1% (Swakopmund/Walvis Bay).

Table 6.2.4. Sexual history and recent sexual behavior with women among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

	Keetmanshoop		Oshakati		Swakop./Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**Crude % (95% CI)**
Ever had anal or vaginal sex with a woman	258	85.0 (75.7 - 92.3)	140	81.4 (72.4 - 89.4)	260	91.6 (86.9 - 95.3)	223	69.3 (64.2 - 74.3)
Age at first sex with woman *(among MSM who ever had sex with a woman, anal or vaginal)*								
< 15 years	48	14.1 (7.8 - 20.7)	36	27.8 (16.6 - 41.4)	71	25.4 (12.3 - 41.1)	53	23.8 (18.1 - 29-4)
15-19 years	188	76.9 (66.4 - 85.3)	88	60.3 (46.6 - 70.8)	150	65.9 (46.8 - 78.4)	141	63.2 (56.9 - 69.6)
≥ 20 years	22	9.0 (2.8 - 18.9)	15	11.9 (4.3 - 22.9)	39	8.7 (3.9 - 19.6)	29	13.0 (8.6 - 17.5)
Number of female sex partners during 12 months preceding the IBBSS.								
none	16	8.9 (4 - 14.9)	34	16 (9.4 - 25.4)	79	22.4 (14.5 - 31.9)	66	20.6 (16.1 - 25.0)
1	32	14.3 (7.5 - 21.9)	31	19.7 (10 - 30.7)	40	16.4 (10.7 - 23.7)	34	10.6 (7.2 - 13.8)
2 to 3	60	23.3 (15.3 - 32.7)	35	20.9 (12.3 - 30.8)	63	21.3 (14.1- 29.7)	53	16.5 (12.4 - 20.6)
≥ 4	208	53.5 (43.4 - 63.5)	94	43.4 (31.6 - 53.7)	137	39.8 (30.0 - 48.4)	168	52.3 (46.8 - 57.8)
Received money, goods or services for sex from woman during 12 months preceding the IBBSS	27	20.0 (10.1 - 31)	22	17.2 (8.2 - 34.5)	42	24.6 (12.8 - 32.1)	33	19.5 (13.5 - 25.6)
Paid money, goods or services for sex to woman during 12 months preceding the IBBSS	18	12.1 (4.9 - 23.9)	15	17.3 (6.1 - 30.8)	64	35.1% (20.2 - 42.9)	28	16.6 (10.9 - 22.3)

Among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, 72.1%, 72.1%, 69.0%, and 65.2%, respectively, used a condom during the most recent time they had anal or vaginal sex **(Table 6.2.5).** Consistent condom use (100% of the time) with male sex partners during the 30 days preceding the IBBSS among MSM ranged from 42.5% in Windhoek to 68.3% in Keetmanshoop. Consistent condom use with female sex partners during the 30 days preceding the IBBSS among MSM ranged from 29.9% in Windhoek to 61.8% in Oshakati. Most MSM perceived that condoms were “very affordable” and “very easy to obtain.” Lubricant use during anal sex was more frequent among MSM in Windhoek relative to the other three sites.

Table 6.2.5. Condom and lubricant use among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

Variable	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)	#	Crude % (95% CI)
Condom used during most recent sex *(with male or female partner, depending on sex of most recent partner)*	219	72.1 (63.5 - 80.9)	147	72.1 (63.4 - 80.6)	202	69.0% (59.7-78.3%)	193	65.2 (59.7-70.7)
Percentage of male anal sex partners with whom a condom was used during 30 days preceding the *IBBSS (among MSM who had any male anal sex partners)*								
0%	52	16.9 (10.4 - 25.6)	27	18.4 (10.1 - 27.0)	44	15.0 (8.8 - 24.0)	50	16.3 (12.4 - 21.0)
1% - 49%	46	7.8 (3.9 - 12.8)	16	10.2 (4.4 - 19.3)	29	9.7 (4.4 - 18.2)	39	12.8 (9.2 - 17.0)
50% - 99%	49	7.0 (3.9 - 11.2)	30	8.7 (5.3 - 13.3)	38	7.3 (3.7 - 12.2)	87	28.4 (23.4 - 33.8)
100%	165	68.3 (58.2 - 76.1)	115	62.7 (50.5 - 72.5)	184	64.1 (52.9 - 72.0)	130	42.5 (36.9 - 48.2)
Percentage of female sex partners with whom a condom was used during past 30 days *(among MSM who had any female partners, vaginal or anal)*								
0%	25	8.2 (4.1 - 15.3)	1	2.2 (0.0 - 5.7)	17	5.0 (1.4 - 9.8)	30	19.1 (13.3 - 26.1)
1% - 49%	56	24.7 (14.0 - 36.3)	8	7.2 (2.1 - 13.5)	32	15.1 (8.3 - 26.5)	26	16.6 (11.1 - 23.3)
50% - 99%	76	22.0 (12.3 - 13.1)	33	28.8 (17.0 - 41.1)	45	26.5 (17.4 - 36.9)	54	34.4 (27.0 - 44.4)
100%	83	45.1 (32.4 - 57.8)	64	61.8 (49.2 - 75.3)	79	53.4 (40.9 - 62.6)	47	29.9 (22.9 - 37.8)
Perception about affordability of condoms								
Very affordable	187	87.8 (81.7 - 92.8)	126	87.8 (81.6 - 92.8)	238	75.2 (72.9 - 86.6)	203	66.6 (61.2 - 71.9)
Somewhat affordable	99	9.6 (5.5 - 15.1)	37	9.6 (5.5 - 15.1)	61	20.3 (11.9 - 25.4)	88	28.9 (23.7 - 34.0)
Not affordable	3	2.5 (0 - 5.8)	19	2.5 (0 - 5.8)	6	4.5 (0.1 - 3.9)	14	4.6 (2.2 - 7.0)
Perception of ease of obtaining condoms								
Very easy	188	90.4 (85.2 - 94.5)	146	90.4 (85.3 - 94.5)	246	80.0 (73.3 - 87.3)	210	68.9(63.6 - 74.1)
somewhat easy	100	9.6 (5.5 - 14.7)	26	9.6 (5.6 - 14.8)	50	15.7 (9.5 - 21.1)	76	24.9(20.0 - 29.8)
Not easy	1	0 (0 - 0)	11	0 (0 - 0)	10	4.4 (0.6 - 10.4)	19	6.2(3.5 - 9.0)
Frequency of lubricant use								
Always	40	6.4 (2.8 -10.8)	44	6.4 (2.8 - 10.9)	62	13.3 (7.2 - 20.9)	143	44.6 (39.0 - 50.2)
Sometimes	51	21.1 (12.8 - 32.6)	43	21.1 (13 - 32.4)	90	21.8 (14.4 - 31.0)	98	30.5 (25.5 - 35.9)
Never	225	72.5 (60.9 - 81.5)	107	72.5 (60.6 - 81.4)	167	64.9 (54.5 – 73.9)	80	24.9 (23.0 - 30.0)

Experience of physical violence and discrimination among MSM

Among MSM in Keetmanshoop, Osshakati, Swakopmund/Walvis Bay, and Windhoek, 6.8%, 2.8%, 2.4%, and 7.5%, respectively, experienced physical violence as a result of being MSM during the twelve months preceding the survey **(Table 6.2.6),** and 6.2%, 1.4%, 0.2%, and 5.6% experienced sexual assault during the twelve months preceding the survey. Less than 10% of MSM in each of the study sites experienced any discrimination as a result of being MSM (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 IBBSS, with the exception of Windhoek, where 14.6% of MSM reported experiencing some form of MSM-related discrimination.

Table 6.2.6. Experience of physical violence and discrimination among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

	Keetmanshoop		Oshakati		Swakop./Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**Crude % (95% CI)**
Physically assaulted for being MSM during 12 months preceding the IBBSS	15	6.8 (2 - 13.8)	8	2.8 (0.2 - 5.9)	9	2.4 (0.4 - 6.0)	24	7.5 (5.0 - 10.9)
Sexually assaulted for being MSM during 12 months preceding the IBBSS	12	6.2 (1.5 - 13.5)	6	1.4 (0.1 - 3.3)	7	0.2 (0.0 - 0.5)	18	5.6 (3.5 - 8.7)
Experienced any discrimination as a result of being MSM during 12 months preceding the IBBSS †	28	7.4 (2.7 - 14.5)	11	3.4 (0.8 - 6.8)	31	5.5 (2.8 - 8.8)	47	14.6 (11.2 - 19.0)

† Experienced any of the following as a result of being MSM 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 MSM

Most MSM consumed alcohol, with percentages of MSM who consumed any alcohol during the twelve months preceding the survey ranging from 83.1% in Keetmanshoop to 94.4% in Windhoek **(Table 6.2.7).** Among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, and Windhoek, 67.7%, 68.1%, 68.1%, and 87.3%, respectively, screened positive for alcohol abuse using the AUDIT-C measure. 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 AUDIT-C scores of 0–12 points. The recommended screening threshold and the one used in the IBBS-MSM was ≥4 points for men.[17] 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))*

Just over half of MSM in Windhoek reported that they had ever used any illicit drug, whereas a lower percentage of MSM in Keetmanshoop, Oshakati, and Swakopmund/Walvis Bay (between approximately 20% - 30%) had ever used an illicit drug. Marijuana was the most frequently used illicit drug among MSM in each study. Use of other illicit drugs - including cocaine, methamphetamine, heroin, and ecstasy – was infrequent with only three MSM in the four study sites combined having ever injected illicit drugs.

Table 6.2.7. Alcohol and drug use among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

	Keetmanshoop		Oshakati		Swakop./Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**Crude % (95% CI)**
Consumed any alcohol during 12 months preceding IBBSS	288	83.1 (74 - 90.5)	168	87.7 (80.5 - 94)	277	83.3 (75.5 - 90.1)	304	94.4 (91.9 - 96.9)
Screened positive for alcohol abuse *(using AUDIT-C measure)* †	256	67.7 (57.1 - 78.6)	123	68.1 (56.6 - 78)	190	68.1 (54.1 - 76.2)	260	87.3 (83.4 - 91.0)
Ever used any drugs	86	34.2 (24.4 - 44.3)	51	26.1 (16.7 - 36.7)	121	32.1 (23.5 - 40.1)	149	46.4 (40.9 - 51.9)
Ever used marijuana	84	33.8 (23.8 - 43.9)	35	21.0 (12.6 - 30.2)	112	31.0 (23.2-39.9)	139	43.3 (37.8 - 48.9)
Ever used cocaine	5	1.5 (0.0 - 4.1)	9	6.9 (2.2 - 12.0)	9	1.7 (0.1 - 1.6)	25	7.9 (5.1 -11.3)
Ever used heroin	1	1.0 (0.0 - 1.7)	2	6.6 (0.0 - 6.9)	3	0.5 (0.0 - 1.4)	4	1.2 (0.3 - 3.1)
Ever used methamphetamine	1	1.0 (0.0 - 1.7)	3	2.7 (0.0 - 5.4)	5	1.5 (0.1 - 1.7)	5	1.6 (0.5 - 3.6)
Ever used ecstasy	2	1.0 (0.0 - 2.6)	9	4.8 (1.0 - 9.4)	3	0.1 (0.0 - 0.2)	14	4.4 (2.4 - 7.2)
Ever injected any illicit drug with a syringe	0	- (- -) ‡	1	3.1 (0.0 - 3.5)	0- (- -)	- (- -) ‡	2	0.6 (0.0 - 2.2)

† 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 and access to medical care among MSM

Less than half of MSM in each of the study sites sought medical care for any reason during the twelve months preceding the IBBSS. Among MSM who sought medical care in the year prior to the survey, less than 5% in each study site experienced any difficulty obtaining care **(Table 6.2.8)**. Similarly, nearly all MSM who attempted to receive a prescribed medication from a medical provider or pharmacy had no difficulty doing so.

Table 6.2.8. Use and access to medical care among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

Variable	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)	#	Crude % (95% CI)
Sought medical care for any reason during 12 months preceding IBBSS	71	30.3 (20.8 - 40.2)	75	38.8 (28.9 - 49.1)	111	36.3 (27.1 - 43.9)	118	36.8 (31.6 - 42.2)
Experienced difficulty accessing medical care *(among MSM who sought care)*	0	- (- -) †	4	0.9 (0 - 6.1)	8	4.8 (0.0 - 10.4)	4	3.4 (1.3 - 8.8)
Experienced difficulty filling a prescription *(among MSM who sought a prescription)*	4	1.0 (0.0 - 2.6)	3	3.1 (0 - 4.2)	8	1.3 (0.0 - 3.6)	6	1.9 (0.8 - 4.1)

† Estimates cannot be generated because a group ("experienced any difficulty accessing care") recruited exclusively from within its own group.

Diagnosis or symptoms of STI among MSM

Less than 10% of MSM reported that they had been diagnosed with a sexually transmitted infection (STI) or experienced symptoms of an STI in the twelve months preceding the IBBSS **(Table 6.2.9)**. The percentage of MSM with symptoms or diagnosis of STI was highest among MSM in Windhoek (9.3%) relative to MSM in the other three sites.

Table 6.2.9. Diagnosis or symptoms of sexually transmitted infection (STI) among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

	Keetmanshoop		Oshakati		Swakop./Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**Crude % (95% CI)**
Had symptom or diagnosis of an STI during 12 months preceding the IBBSS	23	8 (2.7 - 15.2)	4	1.2 (0.0 - 3.1)	23	7.7 (2.7 - 10.2)	30	9.3 (6.1 - 12.5)

HIV prevention knowledge and awareness of ARV medications to treat HIV among MSM

Table 6.2.10 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 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. Among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, and Windhoek, 55.6%, 73.3%, 75.1%, and 64.5%, respectively, had correct composite HIV transmission knowledge.

Additionally, MSM were asked if they were aware that antiretroviral therapy (ART) can be used to treat HIV. Greater than 90% of MSM in each of the study sites were aware of the existence and availability of ART to treat HIV infection.

Table 6.2.10. HIV transmission knowledge and awareness of antiretroviral therapy (ART) to treat HIV among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

	Keetmanshoop		Oshakati		Swakop./Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**Crude % (95% CI)**
Correct HIV transmission knowledge †	210	55.6 (45.5 - 66.9)	156	73.3 (64.1 - 82.5)	248	75.1 (64.4 - 82.9)	207	64.5 (59.1 - 69.6)
Aware of the existence and availability of ART to treat HIV infection	300	90.2 (82.0 - 96.9)	190	98.4 (95.6 - 100)	292	93.1 (88.2 - 97.1)	301	93.8 (90.5 - 95.9)

† 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

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

Most MSM had no contact with an HIV-focused peer educator during the six months preceding the IBBSS **(Table 6.2.8)**, with percentages of those who did ranging from 7.9% in Swakopmund/Walvis Bay to 16.2% in Oshakati. Few MSM participated in HIV-focused meetings or focus group discussions, with percentages of those who did ranging from 10.4% in Keetmanshoop to 37.1% in Windhoek. Among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, and Windhoek, 37.8%, 75.2%, 82.9%, and 58.2%, respectively, "received HIV prevention interventions" according to the GARPR criteria (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 12 months preceding the IBBSS?"*).

Table 6.2.8. Receipt of HIV focused peer outreach and prevention interventions among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

	Keetmanshoop		Oshakati		Swakop./Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**Crude % (95% CI)**
Had contact with an HIV-focused peer educator during 6 months preceding the IBBSS	38	13.8 (7 - 22.4)	34	16.2 (8.2 - 24.8)	49	7.9 (4.6 - 14.1)	34	11.2 (7.7 - 14.8)
Participated in an HIV-focused meeting during 6 months preceding the IBBSS	38	10.4 (5.2 - 16.4)	70	35.7 (25.2 - 46.1)	88	25.7 (18.0 - 36.2)	119	37.1 (31.8 - 42.4)
Reached with prevention programs during 6 months preceding the IBBSS *(according to GARPR definition)*†	142	37.8 (27.9 - 48.4)	139	75.2 (65.8 - 84.1)	258	82.9 (77.8 - 89.7)	189	58.7 (53.1 - 64.1)

† 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?"

Circumcision status among MSM

The majority of MSM were not circumcised **(Table 6.2.9)**. The percentage of MSM who were circumcised in each of the study sites ranged from 27.1% in Keetmanshoop to 39.2% in Windhoek.

Table 6.2.9. Circumcision status among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

	Keetmanshoop		Oshakati		Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**% (95% CI)**
Circumcision status								
Circumcised	64	27.1 (17.5 - 36.6)	61	37.3 (26.7 - 48.6)	102	36.5 (27.8 - 46.0)	126	39.2 (34.0 - 44.7)
Not circumcised	252	72.9 (63.5 - 82.4)	131	62.7 (51.9 - 73.1)	216	63.5 (54.1 - 72.1)	195	60.7 (55.3 - 66.0)

Awareness and use of HIV counseling and testing services among MSM

More than 95% of MSM in each study site reported that they know where to receive a free HIV test **(Table 6.2.10)**. The percentage of MSM who were ever tested for HIV ranged from 68.9% in Keetmanshoop to 74.6% in Swakopmund/Walvis Bay. Less than 50% of MSM who were not already aware of their HIV positive sero-status received HIV counseling and testing in the twelve months preceding the IBBSS. Similarly, less than 50% of MSM in each study site were currently aware of their sero-status at the time of the IBBSS.

Table 6.2.10. Previous HIV counseling and testing among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

	Keetmanshoop		Oshakati		Swakop./Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**Crude % (95% CI)**
Knows where to receive HIV counseling and testing	311	96.2 (91.6 - 99.7)	193	99.5 (98.2 - 100)	314	97.8 (- -)	309	96.3 (94.2 - 98.3)
Ever received HIV counseling and testing	213	68.9 (59.8 - 77.3)	135	66.8 (51.9 - 75.1)	241	74.6 (67.1 - 83.5)	236	73.5 (68.7-78.4)
Currently aware of HIV serostatus †	141	44.4 (34.7 - 55.5)	87	46.9 (35.2 - 56.5)	151	49.7 (41.3 - 59.9)	135	44.3 (38.9 - 49.7)
Tested for HIV during 12 months preceding the IBBSS *(among MSM not already known to be HIV positive)*	131	43.6 (33.6 - 54.9)	86	46.5 (35 - 55.9)	142	49.8 (41.0 - 60.6)	127	42.8 (31.1 - 48.4)

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

Perception of risk for HIV infection among MSM not already known to be HIV positive

Among MSM who had not previously tested positive for HIV in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, and Windhoek, 69.5%, 51.1%, 65.9%, and 47.6%, respectively, believed that they had a very small risk of becoming HIV positive **(Table 6.2.11).**

Table 6.2.11. Perception of risk for HIV infection among MSM not already known to be HIV positive in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

	Keetmanshoop		Oshakati		Swakop./Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**RDS Adj. % (95% CI)**	**#**	**Crude % (CI)**
Self-perception of risk of getting HIV *(among MSM not already known to be HIV positive)*								
No risk to small risk	186	69.5 (59.1 - 78.9)	96	51.1 (40.9 - 62)	164	65.9 (51.2 - 72.0)	142	47.6 (24.3 - 70.9)
Moderate risk to high risk	106	30.5 (21.1 - 40.9)	87	48.9 (38.3 - 58.9)	113	34.1 (27.9 - 49.0)	152	51.7 (46.0 - 57.5)

6.3. HIV prevalence, continuum of engagement in HIV care services, and risk factors for HIV infection among MSM

6.3.1 HIV prevalence and continuum of engagement in HIV care services

This section presents the results of HIV prevalence among MSM and the continuum of engagement in HIV care services among HIV positive MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, and Windhoek. A sub-objective of the IBBSS is to understand whether or not HIV positive MSM are accessing HIV services that have been made available to them through the MoHSS and its partners. For HIV positive persons to fully benefit from ART, they need to know that they are HIV positive through HIV counseling and testing, be linked to care and retained, and to receive and be retained on ART. This process is often referred to as the continuum of engagement in HIV care services.[18] Expanded testing and earlier treatment of infection has the potential to reduce new infections in the general population because HIV positive persons on ART are less likely to transmit the virus to their negative partners. Poor engagement in care among HIV-positive persons would limit the effectiveness of "test-and-treat" strategies under development by the MoHSS and its partners.

According to the rapid test results received by participants in the IBBSS, HIV prevalence was estimated to be 10.2% in Keetmanshoop, 7.1% in Oshakati, 10.1% in Swakopmund/Walvis Bay, and 20.9% in Windhoek **(Table 6.3.1.)**. In Windhoek, where HIV prevalence was more than twice that in the other three sites, one in five MSM were estimated to be HIV positive.

Table 6.3.1. HIV prevalence among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

	Keetmanshoop		Oshakati		Swakop./Walvis Bay		Windhoek	
	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)	#	RDS Adj. % (95% CI)	#	Crude % (95% CI)
HIV test result †								
positive	44	10.2 (4.6 - 18.1)	17	7.1 (2.2 - 13.8)	53	10.1 (5.5-16.5)	59	20.9 (16.0 - 25.6)
negative	272	89.8 (82.1 - 95.4)	169	92.9 (86.3 - 97.9)	259	83.0 (78.8 - 87.2)	224	79.2 (74.3 - 83.9)

† *Refers to the results of the HIV rapid test that was performed on participants during the IBBSS. The percentage of MSM whose HIV rapid test result was positive is equivalent to the HIV prevalence for the study site. Among MSM who participated in the IBBSS in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, 0, 7, 7, and 33 did not consent to HIV rapid testing and were therefore not tested.*

In **Figure 10,** the results from the four study sites are pooled to illustrate the continuum of engagement in HIV care services among all HIV positive MSM who participated in the IBBSS. Crude (i.e., not RDS adjusted) estimates are presented for these pooled data. Among 173 HIV-positive MSM who participated in the IBBSS in the four study sites, 46 (26.6%) were aware of their HIV infection (i.e., previously diagnosed prior to testing in the IBBSS), 39 (22.5%) ever received HIV care from a health care provider, 35 (20.2%) were currently in care (i.e., had received care from a medical provider during the twelve months preceding the IBBSS), 26 (15.0%) had ever received ART, and 26 (15.0%) 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 15% of HIV positive MSM currently on ART, the potential for onward transmission of infection to HIV negative sex partners is high. However, among HIV positive MSM who were aware of their infection, the level of engagement was greater; 39/46 (84.8%) MSM who were diagnosed were linked to care; 35/39 (89.7%) MSM who were linked to care were retained in care; and 26/26 (100%) MSM 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).** However, in all four sites, awareness of serostatus was low, the overall proportion of HIV positive MSM on treatment was low, but engagement in subsequent steps in the continuum appeared to improve following diagnosis of HIV infection.

Figure 10. **Pooled estimates of the continuum of engagement in HIV care services among HIV positive MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.**

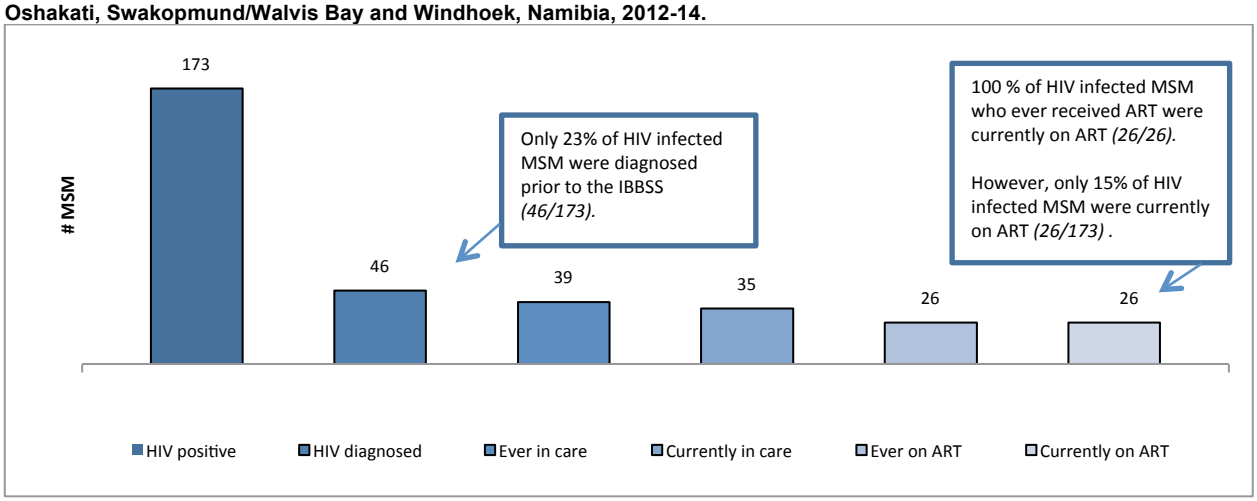


Figure 11. **Estimates of the continuum of engagement in HIV care services among HIV positive MSM in Keetmanshoop, Namibia 2013-2014.**

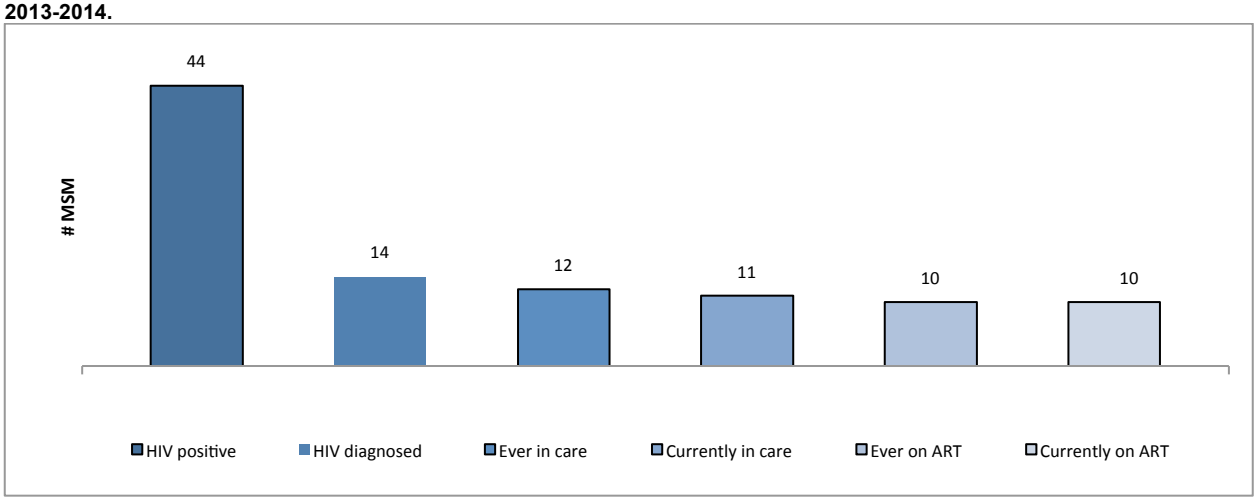


Figure 12. **Estimates of the continuum of engagement in HIV care services among HIV positive MSM in Oshakati, Namibia, 2013-2014.**

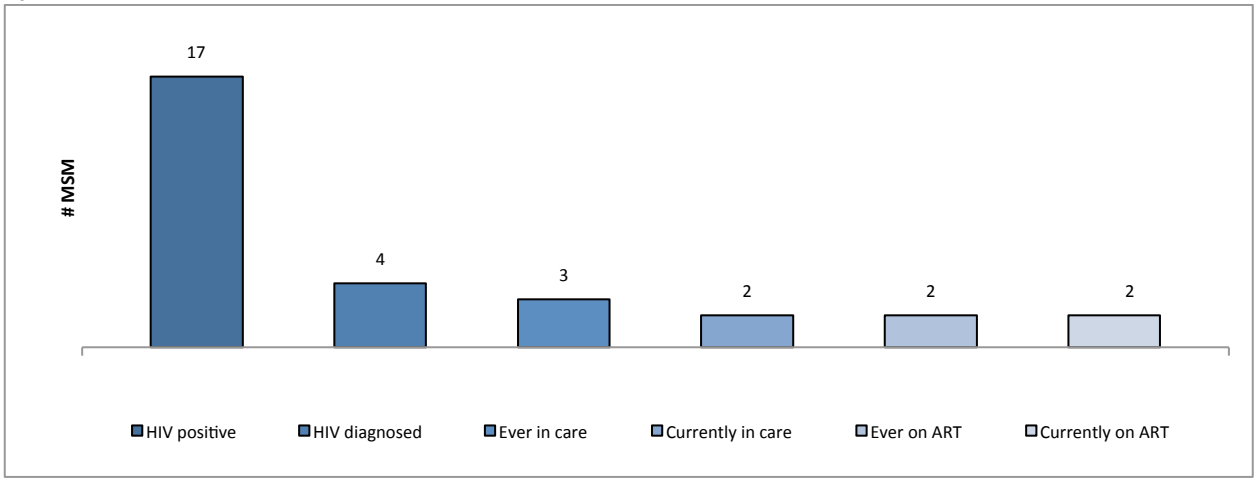


Figure 13. Estimates of the continuum of engagement in HIV care services among HIV positive MSM in Swakopmund/Walvis Bay, Namibia, 2012-2013.

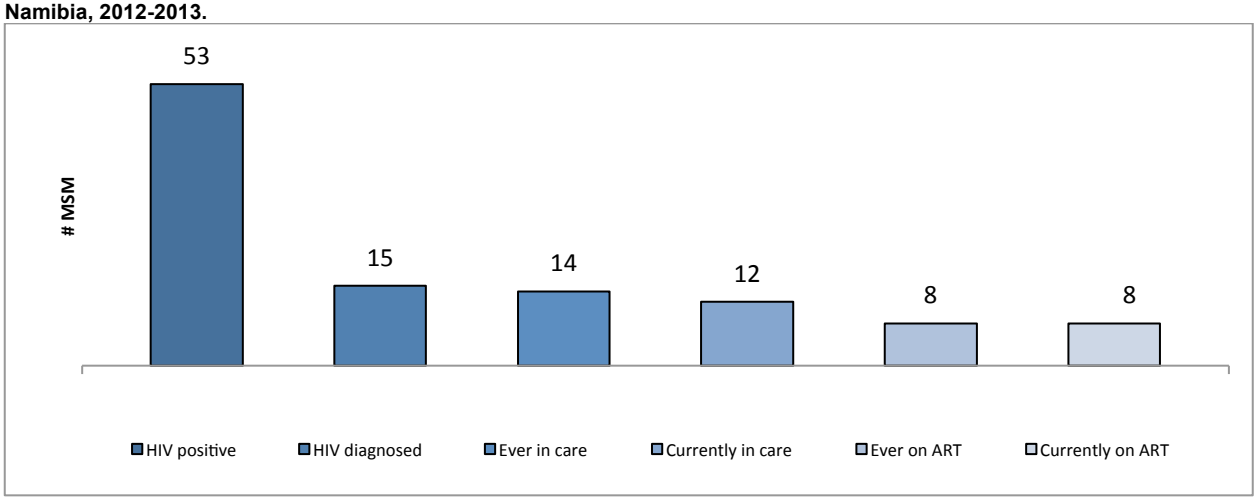
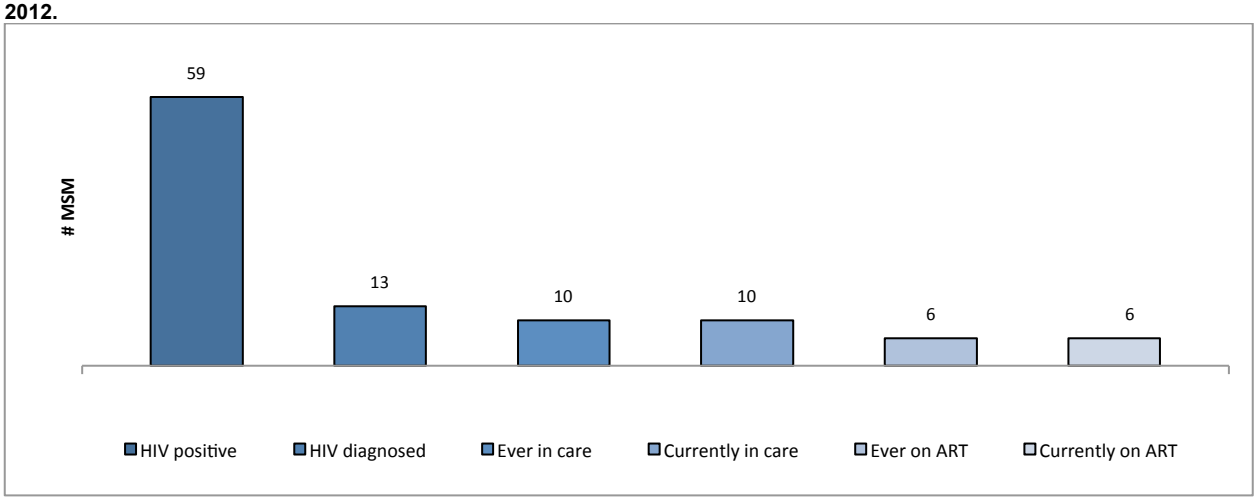


Figure 14. Estimates of the continuum of engagement in HIV care services among HIV positive MSM in Windhoek, Namibia, 2012-2012.



6.3.2 Risk factors for HIV infection among MSM

In this section HIV prevalence results are stratified by demographic variables, sexual behavior with men and women, consumption of alcohol and illicit drugs, and circumcision status. Significant differences (i.e. $P \leq 0.05$) are indicated in the results tables by an asterisk ("*"), borderline significant differences (i.e. $P \leq 0.10$) are indicated in the results tables by two asterisks ("**") and differences that were non-significant but sufficiently different for inclusion in multivariable models (i.e. $P \leq 0.20$) are indicated in the results with three asterisks ("***"). The reference strata for statistical testing of each variable's 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.

HIV prevalence by demographic factors

HIV prevalence was higher among older MSM than it was among younger MSM in each study site **(Table 6.3.2.1).** HIV prevalence was 5.7% among MSM age 15-24 years and 16.5% among MSM age $\geq$ 25 years in

Keetmanshoop; 4.2% among MSM age 15-24 years and 16.8% among MSM age ≥ 25 years in Oshakati; 5.9% among MSM age 15-24 years and 13.9% among MSM age ≥ 25 years in Swakopmund/Walvis Bay; and 9.4% among MSM age 15-24 years and 31.3% among MSM age ≥ 25 years in Windhoek. The difference in HIV prevalence between older and younger MSM was statistically significant in all four study sites.

HIV prevalence was somewhat higher among MSM with less education in Keetmanshoop, Oshakati, and Windhoek, but not in Swakopmund/Walvis Bay. However, the differences in HIV prevalence between more and less educated MSM was not statistically significant in any site **(Table 6.3.2.1).** HIV prevalence was significantly lower among current students in Keetmanshoop and borderline-significantly lower among current students in Oshakati.

Table 6.3.2.1. HIV prevalence stratified by age, education, employment and mobility among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

	Keetmanshoop		Oshakati		Swakop./ Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (CI)**	**#**	**RDS Adj. % (CI)**	**#**	**RDS Adj. % (CI)**	**#**	**Crude% (CI)**
Age								
< 25 years	13	5.7 (1.3 - 11.8)^	6	4.2 (0.2 - 8.2)^	8	5.9 (0.7 - 13.2)^	13	9.4 (4.5 - 14.3)^
≥ 25 years	31	16.5 (5.6 - 32)**	11	16.8 (6.1 - 36.4)**	45	13.9 (7.4 - 25.1)**	40	31.3 (23.1- 39.3)*
Highest level of education completed								
primary or less	11	13.8 (3.2 - 30.3)^	1	6.7 (0.2 - 19.6)^	2	19.9 (0 - 47.9)^	4	15.4 (11.8 - 29.6)^
secondary or more	33	8.9 (3.0 - 17.5)	16	15.6 (6.4 - 28.5)	51	9.6 (5.1 - 15.8)	49	20.4 (15.3 - 25.6)
Currently a student								
Yes	2	1.1 (0.0 - 5.0)^	5	4.2 (0.2 - 8.2)^	5	7.4 (0 - 16.8)^	17	23.3 (13.5 - 33.1)^
No	42	11.6 (5.1 - 20)*	12	16.8 (6.1 - 36.4)**	48	10.7 (5.5 - 17.8)	36	18.8 (13.2 - 24.3)
Employed at any time during 12 months preceding the IBBSS								
Yes	6	8.8 (4.1 - 14.9)^	13	20.2 (0 - 81.2)^	40	23.8 (1.8 - 45.8)^	40	18.6 (13.2-23.5)^
No	38	12.8 (0.3 - 30.7)	4	7.1 (1.8 - 13.7)	13	15.2 (1.9 - 37.4)	13	13.8 (6.8-20.9)
Lived away from study site during 12 months preceding the IBBSS (i.e. "mobile")								
Yes	18	5.4 (2.4 - 9.6)^	14	0.9 (0.1 - 2)^	25	8.6 (5.2 - 19.7)^	15	15.8 (8.4 - 23.2)^
No	26	17.6 (4.6 - 34.6)**	3	11.3 (1.4 - 19.8)**	28	13.6 (5.1 - 23.7)	38	22.2 (15.9 - 28.5)***

** 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.*

There were no significant differences in HIV prevalence observed between MSM who were employed and MSM who were not employed at any time during the twelve months preceding the IBBSS **(Table 6.3.2.1)**. However, mobility (i.e., having lived away from the study site at any time during the twelve months preceding the IBBSS) was associated with a significantly lower level of HIV prevalence in Oshakati (0.9% among those who were mobile and 11.3% among those who were not) and borderline-significantly lower in Keetmanshoop (0.9% among those who were mobile and 11.3% among those who were not).

HIV prevalence by alcohol abuse

HIV prevalence was significantly higher among MSM who abused alcohol in Keetmanshoop (13.8% among those who scored positive for alcohol abuse using the AUDIT-C measure and 2.6% among those who did not) **(Table 6.3.2.2).** No difference in HIV prevalence by alcohol use was noted in the other sties.

Table 6.3.2.2. HIV prevalence stratified by alcohol abuse among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

	Keetmanshoop		*Oshakati*		*Swakop. / Walvis Bay*		*Windhoek*	
Variable	*#*	*RDS Adj. % (CI)*	*#*	*RDS Adj. % (CI)*	*#*	*RDS Adj. % (CI)*	*#*	*Crude % (CI)*
Screened positive for alcohol abuse **(using the AUDIT-C measure)** †								
yes	*39*	*13.8 (5.7 - 24.1)* ^	*8*	*5.9 (0.3 - 13)* ^	*46*	*10.1 (3.3 - 16.4)* ^	*10*	*20.7 (15.4 - 25.6)* ^
no	*5*	*2.6 (0.4 - 6.5)* *	*9*	*12.6 (0.8 - 25.8)*	*7*	*10.9 (1.4 - 21.4)*	*48*	*28.6 (13.3 - 43.8)*

† 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?" **** 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 by symptoms or diagnosis of sexually transmitted infections (STI)

HIV prevalence was higher among MSM who had a diagnosis or symptoms of STI during the twelve months preceding the IBBSS in Keetmanshoop (14.4% among those with STI and 9.7% among those without), Oshakati (47.8% among those with STI and 4.6% among those without), and Windhoek (25.9% among those with STI and 9.3% among those without), although this difference in prevalence was only borderline significantly higher in the Oshakati site **(Table 6.3.2.3)**.

Table 6.3.2.3. HIV prevalence stratified by symptoms or diagnosis of STI during the twelve months preceding the IBBSS among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

	Keetmanshoop		**Oshakati**		**Swakop. / Walvis Bay**		**Windhoek**	
Variable	**#**	**RDS Adj. % (CI)**	**#**	**RDS Adj. % (CI)**	**#**	**RDS Adj. % (CI)**	**#**	**Crude % (CI)**
Had symptoms or diagnosis of STI during 12 months preceding the IBBSS								
yes	7	14.4 (2 - 41.7) ^	1	47.8 (0 - 100) ^	6	5.7 (0 - 17.2) ^	7	25.9 (9.0- 42.9) ^
no	37	9.7 (3.8 - 17.8)	16	4.6 (0.9 - 11.2) **	47	10.0 (4.9 - 16.2)	46	19.3 (14.2 - 24.3)

** 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 by circumcision status

HIV prevalence was borderline significantly higher among MSM who were not circumcised in Oshakati (3.5% among those who were circumcised and 9.7 % among those who were not circumcised) and Windhoek (15.3% among those who were circumcised and 24.4% among those who were not circumcised) **(Table 6.3.2.4)**.

Table 6.3.2.4. HIV prevalence stratified by circumcision status among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

	Keetmanshoop		**Oshakati**		**Swakop./ Walvis Bay**		**Windhoek**	
Variable	**#**	**RDS Adj. % (CI)**	**#**	**RDS Adj. % (CI)**	**#**	**RDS Adj. % (CI)**	**#**	**Crude % (CI)**
Circumcised								
yes	10	9.7 (1.2 - 23.1) ^	4	3.5 (0.5 - 10.2) ^	18	13.3 (4.7 - 26.7) ^	17	15.3 (9.2 - 23.4) ^
no	34	11.1 (4.2 - 20.3)	13	9.7 (2.3 - 20.0) **	35	7.8 (3.4 - 13.7)	42	24.4 (18.2 - 31.5) ^

** 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 by sex behaviours with men

Table 6.3.2.5 presents data on HIV prevalence by sexual history and recent sexual behavior with other men among MSM in the four study sites.

Table 6.3.2.5. HIV prevalence stratified MSM by sexual history and recent sexual behavior with other men among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

	Keetmanshoop		Oshakati		Swakop./Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (CI)**	**#**	**RDS Adj. % (CI)**	**#**	**RDS Adj. % (CI)**	**#**	**Crude% (CI)**
Age at first anal sex with man								
< 15 years	8	13.9 (1.8 - 45)^	0	(- -)	3	0.8 (0 – 1.0)^	7	20.0 (6.5 - 33.5)^
15-19 years	21	5.5 (2 - 10.1)	8	4.2 (1.5 - 9.2)^	17	10 (2.6 - 23.4)	23	19.0 (11.9 - 26.1)
> 20 years	15	17.3 (3.7 - 34)	9	13 (1.6 - 26.9)	32	9 (3.6 - 16.2)	22	21.2 (13.3 - 29.1)
Received payment for sex from a man during 12 months preceding the IBBSS								
yes	19	16.3 (3.9 - 33.7)^	4	3.2 (0 - 7.2)^	15	6.1 (1.1 - 13.3)^	21	16.9 (10.3 -23.6)^
no	25	6.2 (2.7 - 11.1)***	12	10.3 (1.4 - 18.9)***	34	13.1 (6.0 - 22.3)***	31	23.3 (16.1 - 30.6)***
Made payment to a man for sex during 12 months preceding the IBBSS								
yes	4	7.8 (0 - 34.5)^	3	3 (0 - 12.1)^	7	18.8 (0 - 43.6)^	11	29.7 (14.7 - 44.7)^
no	40	10.8 (4.5 - 19.2)	14	7.2 (1.6 - 15.5)	43	8.7 (4.5 - 14.7)	41	18.6 (13.5 - 23.8)***
Number of male anal sex partner during 12 months preceding the IBBSS								
1	5	6.7 (0.5 - 18.1)^	7	8.4 (0.9 - 24.3)^	8	3.3 (0 - 11.3)^	8	14.0 (4.9 - 23.2)^
2 to 3	9	12.4 (1.3 - 29.8)	4	4.2 (0 - 12.6)	12	2.5 (0.6 - 5.5)	12	14 (6.6 - 21.4)
≥ 4	30	13.7 (5.9 - 23.3)	6	11.1 (5.4 - 28.2)	33	48.3 (9.9 - 69.7)*	33	27.3 (19.3 - 35.3)*

** 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.*

In Swakopmund/Walvis Bay and Windhoek, HIV prevalence was significantly higher among MSM with ≥ 4 male anal sex partners during the 12 months preceding the IBBSS (48.3% in Swakopmund/Walvis Bay and 27.3% in Windhoek) than HIV prevalence among MSM with only one male anal sex partner (3.3% in Swakopmund/Walvis Bay and 14.0% in Windhoek).

HIV prevalence by sex behaviours with women

Table 6.3.2.6 presents data on HIV prevalence by sexual behavior with women among MSM in the four study sites. As shown in section **6.2 (Table 6.2.4)** the majority of MSM in all sites had at least one female sex partner during the 12 months preceding the IBBSS. The following results include data from only those MSM who had at least one female sex partner during the twelve months preceding the IBBSS.

Table 6.3.2.6. HIV prevalence stratified by sexual history and recent sexual behavior with women among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

	Keetmanshoop		Oshakati		Swakop./ Walvis Bay		Windhoek	
Variable	**#**	**RDS Adj. % (CI)**	**#**	**RDS Adj. % (CI)**	**#**	**RDS Adj. % (CI)**	**#**	**Crude % (CI)**
Received payment for sex from a woman during 12 months preceding the IBBSS								
yes	3	18.4 (0 - 56.1)^	0	0.0 (---)	3	1.0 (0 - 1.6)^	4	13.8 (0.9 - 26.7)^
no	21	4.4 (1.7 - 8.4)	9	6.6 (0 – 28.0)	17	13.1 (2.2 - 19.7)*	16	13.8 (7.4 - 20.2)
Made payment to a woman for sex during 12 months preceding the IBBSS								
yes	19	4.4 (0 - 22.6)^	0	0.0 (---)	6	16.0 (0 - 37.2)^	2	8.0 (0 - 18.9)^
no	5	8.9 (2.1 - 20.5)	9	6.6 (0 - 27.4)	14	3.8 (0.2 - 5.3)***	18	15.0 (8.5 - 21.5)
Number of female anal or vaginal sex partner during 12 months preceding the IBBSS								
none	1	19.2 (0 - 48.5)^	5	9.0 (2.5 - 24.9)^	9	4.0 (0.8 - 8.7)^	12	21.1 (10.3 - 31.8)^
1	5	5.0 (0.2 - 15.0)	6	31 (8.5 - 48.1)*	6	3.3 (0 - 5.5)	4	12.5 (0.8 - 24.2)
2 to 3	5	4.1 (0.4 - 10.2)	0	0.0 (---)	5	10.0 (0.6 - 23.7)	5	11.9 (1.9 - 21.9)
> 4	33	13.9 (4.9 - 26)*	6	9.4 (0.6 - 22.7)	33	17.0 (7.1 - 28.5)*	32	23.9 (16.6 - 31.2)

** 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 lower among MSM who received payment from women for sex during the 12 months preceding the IBBSS (1.0%) than among MSM who did not (13.1%) in Swakopmund/Walvis Bay. In Keetmanshoop and Swakopmund/Walvis Bay HIV prevalence was significantly higher among MSM with ≥ 4 female sex partners during the 12 months preceding the IBBSS that among MSM with no female partners. Among MSM in Oshakati, HIV prevalence was signficicantly higher among MSM with one female partner than it was among MSM with no female partners.

6.3.2.7 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 bivariable associations **(results in section 6.3.2)** produced a *P* value ≤ 0.2. (i.e. those variables indicated with asteriskes ("*", "**", or "***") in the results tables in **section 6.3.2**).

RDSAT-produced survey weights were constructed using HIV infection as the outcome, exported to STATA, and applied to the regression analysis of data collected from MSM in the Keetmanshoop, Oshakati, and Swakopmund/Walvis Bay IBBSS sites. Survey weights were not applied to the regression analysis of data collected from MSM in the Windhoek site for the reasons related to violating RDS assumptions discussed in the Methods above. The regression analysis was performed using STATA. Adjusted odds ratios, 95% confidence intervals and P values were calculated. Variables that were significantly (*P* ≤ 0.05, indicated by "*" in **Table 6.3.2.7**) or borderline significantly (*P* ≤ 0.1, indicated by "**" in **Table 6.3.2.7**) associated with HIV infection in the full multivariable were retained in the final multivariable model.

According to the final multivariable logistic regression models (Table 6.3.2.7), risk factors associated with HIV infection varied by study site. Older age (AOR: 1.09 per advancing year) and screening positive for alcohol abuse (AOR: 8.69) were significantly associated with an increased likelihood of HIV infection among MSM in

Keetmanshoop. MSM in Keetmanshoop who were current students were significantly less likely to be infected than non-students (AOR: 0.09).

Older age (AOR: 1.32 per advancing year), symptoms or diagnosis of an STI during the past twelve months (AOR: 12.48), and having a female sex partner during the previous twelve months (AOR: 9.84) were significantly associated with an increased likelihood of HIV infection among MSM In Oshakati. Living outside of the study city area for any time during the previous twelve months (AOR: 0.08) and circumcision (AOR: 0.18) were significantly associated with a decreased likelihood of HIV infection among MSM in Oshakati.

Older age (AOR: 1.08 per advancing year) and having a greater number of male anal sex partners during the past twelve months (AOR: 1.25 per additional partner), respectively, were borderline and significantly associated with an increased likelihood of HIV infection among MSM in Swakopmund/Walvis Bay. MSM in Swakopmund/Walvis Bay who received payment from a woman for sex (AOR: 0.02) were less likely to be infected.

Older age (AOR: 1.07 per advancing year) and having a greater number of male anal sex partners during the past twelve months (AOR: 1.02 per additional partner) were significantly associated with increased likelihood of HIV infection among MSM in Windhoek.

Table 6.3.2.7. Results of multivariable logistic regression analysis to assess predictors of HIV infection among MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-14.

		Full multivariable model ^		Final multivariable model †	
Study site	**Variable**	**AOR (CI) ‡**	***P*-val.**	**AOR (CI) ‡**	***P*-val.**
Keetmanshoop					
	Age *(per advancing year)*	1.07 (0.99 - 1.13)	*	1.09 (1.00 - 1.18)	*
	Currently a student *(vs. not a student)*	0.14 (0.02 - 1.02)	*	0.09 (0.01 - 0.69)	*
	Lived away from study site at any time during past 12 months *(vs. did not live away from study site)*	0.44 (0.14 - 1.37)		(- -)£	(- -)£
	Screened positive for alcohol abuse using AUDIT-C measure (*vs. did not screen positive*)	5.77 (0.92 - 36.1)	**	8.69 (1.25 - 60.6)	*
	Received payment for sex from another man during past 12 months *(vs. did not receive payment for sex from another man)*	1.99 (0.63 - 6.31)		(- -)£	(- -)£
	≥ 4 female sex partners during past 12 months *(vs. less than 4)*	2.09 (0.42 - 10.5)		(- -)£	(- -)£
Oshakati					
	Age (*per advancing year)*	1.32 (0.99 - 1.78)	**	1.32 (1.09 - 1.60)	*
	Currently a student *(vs. not a student)*	0.38 (0.07 - 2.10)		(- -)£	(- -)£
	Screened positive for alcohol abuse using AUDIT-C measure (*vs. did not screen positive*)	0.48 (0.09 - 1.93)		(- -)£	(- -)£
	Lived away from study site at any time during past 12 months *(vs. did not live away from study site)*	43.6 (2.98 - 639.3)	*	13.0 (1.44 - 117.7)	*
	Symptoms or diagnosis of STI during past 12 months *(vs. no STI)*	14.7 (1.42 - 176.03)	*	12.48 (1.23 - 126.7)	*
	Circumcised *(vs. not circumcised)*	0.16 (0.03- 1.02)	*	0.18 (0.03 - 1.13)	*
	Received payment for sex from another man during past 12 months *(vs. did not receive payment for sex from another man)*	0.30 (0.03 - 2.94)		(- -)	(- -)
	Had one female sex partners during past 12 months *(vs. none)*	5.3 (1.01 - 27.77)	*	9.84 (1.76 - 55.03)	*
Swakopmund/ Walvis Bay					
	Age *(per advancing year)*	1.07 (0.99 - 1.16)	**	1.08 (0.99 - 1.17)	**
	Received payment for sex from another man during past 12 months *(vs. did not receive payment for sex from another man)*	0.31 (0.53 -1.85)		(- -)£	(- -)£
	Number of male anal sex partners during past 12 months *(per additional partner)*	1.26 (1.12 - 1.41)	*	1.25 (1.12 - 1.39)	*
	Made payment to a woman for sex during past 12 months *(vs. did not make payment to a woman for sex)*	1.21 (0.23 - 6.30)		(- -)£	(- -)£
	Received payment for sex from woman during past 12 months *(vs. did not received payment from a woman for sex)*	0.22 (0.01 - 0.43)	*	0.02 (0.73 - 10.20)	*
	≥ 4 female sex partners during past 12 months *(vs. less than 4)*	3.37 (0.79 - 14.3)	**	2.73 (0.73 - 10.19)	
Windhoek					
	Age *(per advancing year)*	1.07 (1.03 - 1.11)	*	1.07 (1.03 - 1.11)	*
	Lived away from study site at any time during past 12 months *(vs. did not live away from study site)*	0.71 (0.36 - 1.41)		(- -)£	(- -)£
	Circumcised *(vs. not circumcised)*	0.58 (0.30 - 1.13)		(- -)£	(- -)£
	Number of male anal sex partners during past 12 months *(per additional partner)*	1.02 (1.00 - 1.04	*	1.02 (1.00 - 1.04)	*
	Made payment to a man for sex during past 12 months *(vs. did not make payment to a man for sex)*	1.86 (0.83 - 4.15)		(- -)£	(- -)£
	Received payment for sex from a man during past 12 months *(vs. did not receive payment from man for sex)*	0.67 (0.35 - 1.25)		(- -)£	(- -)£

*^ Full multivariable model includes independent variables that produced a P value < 0.2 in tests for statistical significance of bivariable associations. † Variables that were significantly (P < 0.5) or borderline significantly (P < 0.1) associated with HIV infection in the full multivariable were included in the final multivariable model... ‡ Adjusted odds ratios (AOR) are weighted with RDSAT-exported survey weight in the Keetmanshoop, Oshakati and Swakopmund/Walvis Bay sites. AOR are not weighted in the Windhoek site. * 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. MSM population size estimation

6.4.1 MSM population size estimation by method

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

Mapping

During the formative assessment stage, study teams visited all hotspots that were identified by key informants and counted the number of MSM in each venue – whose orientation was also guided by the key informants. This mapping method counted 282 MSM in Keetmanshoop, 78 MSM in Oshakati, 488 MSM in Swakopmund/Walvis Bay, and 460 MSM in Windhoek. Half the count was used as the lower acceptable bound; one-third more was taken as the upper bound.

Key Informant interviews

Key informants were interviewed in each of the study sites, including seven in Keetmanshoop, six in Oshakati, six in Swakopmund/Walvis Bay, and nine in Windhoek. Each key informant was asked to provide their estimate or guess of how many MSM 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 male population. The median of the key informant estimates within a study location was used as the overall population size estimate. The key informant method estimated 1,133 MSM in Keetmanshoop, 2,000 MSM in Oshakati, 100 MSM in Swakopmund/Walvis Bay, and 300 MSM in Windhoek. The 25th and 75th percentile responses were used as the lower and upper acceptable bounds, respectively.

Unique Object Multiplier

A total of 217, 383, 149, and 243 unique objects (key chain torches) were distributed to MSM in the Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, and Windhoek study areas, respectively, prior to implementation of the IBBSS. A total of 40, 21, 35, and 16 participants in the Keetmanshoop, Oshakati, Swakopmund/Walvis Bay, and Windhoek study areas, respectively, reported that they had received a unique object prior to participating in the study. Using these figures and their overlap, the unique object multiplier method estimated 1,714 MSM in Keetmanshoop, 3,538 MSM in Oshakati, 2,982 MSM in Swakopmund/Walvis Bay, and 2,229 MSM in Windhoek. A 95% confidence interval for these point estimates was generated using capture-recapture approaches and the design effect of the percent receiving a torch in the RDS survey.

Wisdom of the Crowd

During administration of the behavioural questionnaire component of the IBBSS, each participant was asked how many MSM 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 estimate. The 25th and 75th percentiles were used as lower and upper acceptable bounds, respectively. The wisdom of the crowd method estimated 100 MSM in Keetmanshoop, 150 MSM in Oshakati, 70 MSM in Swakopmund/Walvis Bay, and 400 MSM in Windhoek. The 25th and 75th percentile responses were used as the lower and upper acceptable bounds, respectively.

Literature review

No data exist on prevalence of MSM behavior in Namibia. Therefore, the literature review method applied data on the percentage of adult MSM who was estimated by a recent study in Ghana, which was 1.4% (acceptable bounds: 0.4% - 2.3%). This point estimate (1.4%) and lower (0.4%) and upper (2.3%) acceptible bounds were applied to the adult male population of the study areas in Namibia to estimate the size of MSM populations in

each study area. As a result, the literature review method estimated 84 MSM in Keetmanshoop, 157 MSM in Oshakati, 427 MSM in Swakopmund/Walvis Bay, and 1,207 MSM 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 MSM 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 Keetmanshoop and Oshakati study areas, and to extrapolate for the country as a whole. Representatives from the MoHSS, CDC, the United States Agency for International Development (USAID), and Namibian-based NGO's that work with MSM and MSM 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 MSM 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 MSM 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 modified Delphi panel 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. Stakeholders 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 Keetmanshoop 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.

The stakeholder consensus estimate (and acceptable bounds) of the MSM population was; 500 (300 - 650) in Keetmanshoop; 500 (350 - 800) in Oshakati; 610 (475 - 658) in Swakopmund/Walvis Bay, and 2,416 (850 - 4,000) in Windhoek **(Table 6.4.1)**

Table 6.4.1. Estimates of the population size of MSM in Keetmanshoop, Oshakati, Swakopmund/Walvis Bay and Windhoek, Namibia, 2012-2014.

Population size estimation method	Study site	Estimated number of MSM (Acceptable bounds)	Estimated % of adult male population who are MSM (Acceptable bounds) †
Mapping			
	Keetmanshoop	282 (141 - 423)	4.7 (2.4 - 7.1)
	Oshakati	78 (39 - 117)	0.7 (0.4 - 1.)
	Swakopmund/Walvis Bay	488 (244 - 732)	1.6 (0.8 - 2.4)
	Windhoek	460 (230 - 690)	0.5 (0.3 - 0.8)
Key informant interview			
	Keetmanshoop	1,132 (200 - 2,948)	18.9 (3.9 - 49.3)
	Oshakati	2,000 (250 - 5,184)	17.8 (2.2 - 46.1)
	Swakopmund/Walvis Bay	100 (70 - 300)	0.3 (0.2 - 1.0)
	Windhoek	300 (100 - 1,600)	0.4 (0.1 - 1.9)
Unique object multiplier			
	Keetmanshoop	1,714 (1,292 - 2,359)	28.6 (21.6 - 39.4)
	Oshakati	3,538 (2,379 - 5,632)	31.5 (20.6 - 50.1)
	Swakopmund/Walvis Bay	2,982 (2,013 - 5,808)	9.8 (6.6 - 19.1)
	Windhoek	2,229 (1,699 - 3,240)	2.6 (2.0 - 3.8)
Wisdom of the crowd			
	Keetmanshoop	100 (40 - 400)	1.7 (0.7 - 6.7)
	Oshakati	150 (50 - 500)	1.3 (0.4 - 4.3)
	Swakopmund/Walvis Bay	70 (40 250)	0.2 (0.1 - 0.8)
	Windhoek	400	0.5 (0.1 - 2.3)
Literature review			
	Keetmanshoop	84 (24 - 138)	1.4 (0.4 - 2.3)
	Oshakati	157 (45 - 259)	1.4 (0.4 - 2.3)
	Swakopmund/Walvis Bay	427(122 - 701)	1.4 (0.4 - 2.3)
	Windhoek	1,207(345 - 1,983)	1.4 (0.4 - 2.3)
	Keetmanshoop	500 (300 - 650)	8.4 (4.0 - 10.9)
	Oshakati	500 (350 - 800)	4.5 (3.1 - 7.1)
	Swakopmund/Walvis Bay	610 (475 - 658)	1.6 (1.2 - 1.7)
	Windhoek	2,416 (850 – 4,000)	2.4 (0.8 - 3.9)

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

6.4.2 Extrapolation of IBBSS population size estimates in 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 males in all other *non-IBBSS* urban areas of Namibia. Stakeholders were provided the denominator of adult males from the census and instructed to take into consideration the percentage of adult males or absolute number of MSM 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 MSM 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 males in all other *non-IBBSS* urban areas of Namibia (as measured by the 2011 Namibia Population and Housing Census) to produce a count of MSM 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 males in all rural areas of Namibia. Again, stakeholders were instructed to take into consideration the percentage of adult males in each IBBSS study area estimated to be MSM that 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 MSM 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 males in all other *non-IBBSS* urban areas of Namibia (as measured by the 2011 Namibia Population and Housing Census) to produce a count of MSM males in all rural areas of Namibia.

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

4. The count and acceptable bounds of MSM 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 MSM in Namibia. This count was then divided by the total number of adult males in all of Namibia (as measured by the 2011 Namibia Population and Housing Census) and multiplied by 100 to produce an estimated percentage of all adult males in Namibia who are MSM.

As a result of this process of extrapolation (**Table 6.4.2.1**), it was estimated that there are; 1,482 MSM residing in all non-IBBSS urban areas of Namibia; 1,000 MSM residing in all rural areas of Namibia; 4,026 MSM residing in all four IBBSS study areas combined, and; 6,508 MSM residing in all of Namibia.

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

Geographic area	Estimated number of adult males †	Estimated number of MSM (Acceptable bounds)	Estimated % of adult male population who are MSM (Acceptable bounds)
All non-IBBSS urban areas in Namibia	123, 524	1,482 (300 - 5,682)	2.0 (0.9 - 4.2)
All rural areas in Namibia	370,760	1,000 (400 – 6,025)	0.3 (0.1 - 1.6)
All IBBSS study areas combined	156,172	4,026 (1,975 - 6,108)	Not calculated
All of Namibia	650, 456	6,508 (2,675 - 17,815)	1.0 (0.4 - 2.7)

† *As measured by the 2011 Namibia Population and Housing Census.*

Finally, stakeholders were asked to develop a list of other, non-IBBSS urban and rural area "hotspots" wherein the percentage of adult males who are MSM 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 MSM "hotspots" in Namibia, 2012- 2014.

Non-IBBSS, urban hotspots	Non-IBBSS, rural hotspots
Otjiwarango	Opuwo
Rehoboth	Rosh Pinah
Rundu	Oranjemund
Karibib	Aranos
Usakos	Kalkrand
Mariental	Outapi
Uis	Noordover
Luderitz	Ausenkerhr
Grootfontein	Ariamsvlei
Gobabis	Katwitwi
Karasburg	Tubuesies
Tsumeb	Otjimbingwe
Omaruru	Okombahje
Arandis	Spitzkoppe
Henties Bay	Gibeon
Okahao	Aroab
Okahandja	Koes
	Aus
	Oniipa
	Oshigambo
	Onethindi
	Divundu

7. CONCLUSIONS AND RECOMMENDATIONS

7.1. Key findings

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

Objective #1 was to measure the prevalence of HIV among Namibian MSM. Our surveys found HIV prevalence to be 20.9% among MSM in Windhoek, 10.2% in Keetmanshoop, 10.2% in Walvis Bay/Swakopmund, and 7.1% in Oshakati. Each of these estimates are above the conventional 5% threshold to define a "key population" at elevated risk for HIV.[19] However, only the estimate for Windhoek exceeds the overall national prevalence of 14.3% of Namibian adults.[20] These estimates also tend to be lower than that of MSM in other cities of sub-Saharan Africa, for example, in Blantyre, Lilongwe, Cape Town, Dakar, Durban, Gaborone, Johannesburg, and Mombasa where between 20% and 50% of MSM are positive. Such findings may be optimistically interpreted that infection has not yet risen to the high levels observed among MSM in much of the rest of the world and that an opportunity for prevention presents itself. Programs that are able to reach MSM, with effective prevention messages and interventions, now stand to avert many new infections. A less sanguine view is that MSM communities in cities and towns in Namibia may be on their way to experiencing the higher HIV prevalence of MSM in Windhoek, and, if action is not taken soon, the long term will face a greater prevention challenge. That is, 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 MSM.

Objective #2, measuring the uptake of health services, corroborates the challenge in reaching MSM. Among HIV-positive MSM surveyed, the vast majority were not engaged in HIV care or were ever on ART: 89.8% in Windhoek, 88.2% in Oshakati, 84.9% in Swakopmund/Walvis Bay, and 77.3% in Keetmanshoop. Lack of awareness of HIV serostatus appears to be the biggest gap in the continuum of service delivery and greatest contributor to the low proportion HIV positive MSM who are receiving ART. Given the effectiveness of treatment in preventing onward transmission[21-23] and these low levels of ART uptake, inclusion of MSM in Namibia's

developing “test and treat” policies coupled with new interventions designed to improve awareness of serostatus could prove particularly effective. Other key service use indicators fall short of recommended targets, including the majority of MSM not testing for HIV, most not aware of their HIV status, and substantial numbers not using condoms. Although many MSM 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 an extraordinarily effective method of overcoming challenges related to accessing MSM and are more likely to result in uptake of prevention services among MSM.[24]

Objective #3 was to estimate the number of MSM 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 methods as available to us and soliciting the input of experts, community members, and other stakeholders. A working consensus was reached for the numbers of MSM in the four cities and extrapolated to Namibia as a whole. Our best estimate is that there are 6,508 MSM in Namibia, which translates to 1.0% of the adult male population. This figure is low by global standards which project between 2% and 5% of adult males as MSM, but is typical of estimates for sub-Saharan African countries. Nonetheless, our projections indicate that urban areas of Namibia fall at the low end of this range (2.0%), and the upper acceptable bound (2.7%) was within this international range. Having a data-based number to work from provides realistic targets for the delivery of services to MSM in Namibia. Governmental and non-governmental programs can agree upon and be held accountable to performance measures such as the number of MSM reached by prevention programs, numbers tested, and numbers of HIV-positive MSM linked to care.

We also learned several other key features of the epidemiology of HIV among MSM in Namibia. A common finding was the high level of bisexuality among MSM in Namibia, with most having female in addition to male partners and substantial numbers having multiple female and multiple male partners in the last year. HIV infection was significantly elevated among MSM with female partners, highlighting the high potential for transmission to and from women and the need for prevention programs to address both sexual risks. Independent of having multiple male or multiple female sex partners, HIV prevalence was elevated in association with other STIs, alcohol use, being out of school, residing in the city, and lack of circumcision in different locations. 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.

7.2. Survey limitations

No study is without limitations. We therefore highlight errors and potential biases that may affect interpretation of the IBBSS for MSM in Namibia:

1. Although RDS surveys are held to approximate probability-based data, and may be among the most robust sampling methods available for hidden populations at this time, it is possible that certain sub-groups of MSM are not reached or well-represented due to how social networks are formed. At present, there is no gold standard or complete census of MSM against which to validate the IBBSS findings. We therefore advise caution in interpretation.

2. IBBSS for MSM was conducted in only four locations in Namibia, including major cities and towns. Findings here may not apply to other regions of the country. In addition, the situation among MSM in rural areas may be different from the data presented here.

3. The IBBSS in Windhoek met with several theoretical and practical problems that compromised its integrity as an RDS survey; the data should therefore be considered a convenience sample that may have less validity in representing the MSM population. Nonetheless, the survey was inclusive and diverse and we believe that it does provide insights into health issues faced by MSM in Windhoek.

4. While not excluded from this IBBSS, transgendered persons were not separately identified or specifically recruited. A survey particular to transwomen and their specific health and welfare needs may be required for Namibia.

7.3. Recommendations

High percentages of MSM with multiple male and female sex partnerships, combined with inconsistent condom use and low prevention program coverage suggest that HIV may be transmitted frequently within the MSM population and between MSM and the general population. An alarmingly high proportion of HIV-positive MSM have not been previously diagnosed. However, the high ART coverage, retention, and adherence to ART following diagnosis observed among MSM in this study suggests that universal eligibility "test-and-treat" programs could be successful if the frequency of HIV testing and counseling (HTC) can be improved. Infrequent health care use among MSM suggests that provider-initiated testing and counseling strategies alone may be insufficient, and that enhanced community based approaches to HTC service delivery are urgently needed. As a result, we recommend the MoHSS and its partners consider:

1. Establishing new and strengthening existing targeted interventions to reach all MSM with frequent HTC services, including enhanced community-based approaches to HTC service delivery, which will maximize knowledge of serostatus and facilitate linkage to HIV care.

2. Addressing risk factors associated with HIV infection among MSM – including older age, multiple concurrent (?) male and female sex partnerships, and inconsistent condom use with male and female sex partners – in the development of interventions and services. MSM-friendly STI services and information on alcohol use and HIV risk are also needed.

3. Including MSM in voluntary medical male circumcision (VMMC) programs may provide the benefit of protection from infection from female partners and interrupt chains of transmission between MSM and women and their male partners in the general population.

4. Including MSM in the ongoing development of Namibia's combination prevention strategy and "test-and-treat" interventions.

5. Using the population size estimates to set feasible targets for numbers of MSM to be reached by interventions and monitor the shortfall or success in coverage.

Success in implementing these recommendations and their impact on the HIV epidemic among MSM 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 MSM in diverse contexts. The methodology can be adapted to deliver programs and reach other hidden populations at high risk, such as transgendered persons. However, because patterns of recruitment in the Windhoek MSM study site failed to meet the theoretical assumptions of RDS, alternative sampling methodologies may still be required among certain key populations. Nevertheless, 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 MSM have not been left out.

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