

Integrated Behavioral and Biological
Surveillance Survey among Female Sex
Workers, 2010

INVESTIGATORS AND INSTITUTIONS

AIDS Unit, Ministry of Health & Quality of Life

Funding and institutional involvement

This study was funded by the Global Fund through the Mauritius National AIDS Secretariat of the Prime Minister's Office.

Technical Working Group for Most At Risk Populations (MARPs)

The MARPs Technical Working Group provides oversight and technical guidance in survey design, implementation, analysis and dissemination, and advises on stakeholder engagement and collaborations throughout the study. The group consists of seven members, including investigators, drawn from research and academic institutions with specific relevant technical expertise.

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ABBREVIATIONS/ACRONYMS

ART	Antiretroviral Therapy
IBBS	Integrated behavioral and biological surveillance
DEFF	Design Effect
FSW	Female Sex Worker
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HIV	Human Immunodeficiency Virus
IDU	Injection Drug Use
IDUs	Injection Drug Users
MARP	Most at risk population
MOH & QL	Ministry of Health and Quality of Life
NGO	Non-Governmental Organization
PILS	Prévention Information Lutte contre le Sida
RDS	Respondent Driven Sampling
RDSAT	Respondent Driven Sampling Analysis Tool
STI	Sexually Transmitted Infection
TWG	Technical Working Group
VCT	Voluntary Counseling and Testing
WHO	World Health Organization

EXECUTIVE SUMMARY

This report presents findings of the first round of an integrated behavioral and biological surveillance (IBBS) survey conducted among Female Sex Workers (FSWs) in Mauritius during the month of August 2010. The primary objective of this survey was to provide information on the prevalence of HIV infection and associated risk factors among FSWs to inform programmatic and policy responses and provide a baseline from which to monitor epidemic trends. While the prevalence of HIV infection in Mauritius remains just under 1% in the general population according to sentinel surveillance, routine HIV surveillance among FSWs and other hard-to-reach populations is just now being conducted. Just prior to this IBBS of FSWs, an IBBS of Injecting Drug Users (IDUs) and an IBBS of Men who have Sex with Men (MSM) were successfully conducted in Mauritius in 2009 and 2010, respectively.

The 2010 FSW HIV IBBS survey was implemented by the AIDS Unit of the Ministry of Health and Quality of Life (MOH&QL) based in Port Louis, Mauritius. This surveillance survey used respondent-driven sampling (RDS) to obtain a sample of 299 females who reported having vaginal, anal or oral sex in the last six months with a male in exchange for money or kind, aged 15 years and older, and living in Mauritius. RDS is a chain-referral sampling method specifically designed to obtain probability-based samples of 'hidden' and hard-to-reach populations. After providing informed consent, respondents completed an interview and provided blood specimens to be tested for HIV, Hepatitis B (HBV), Hepatitis C (HCV) and syphilis. Proportion estimates adjusted for participants' probability of recruitment were calculated using RDS Analysis Tool (RDSAT) Version 6.0.

The findings from this survey will identify gaps in existing programs and help the development of long-term intervention and prevention strategies responsive to the needs of FSWs in Mauritius.

Key Findings

HIV prevalence among FSWs was 28.9%; prevalence of HCV was 43.8% and syphilis was 5.1%. No one tested positive for HBV. HIV co-infection with HCV was 89% (CI. 84.4, 97.2). Ninety two percent (CI. 84.5, 97.2) of FSWs who tested positive for HCV also reported injecting drugs in the previous three months. Only 10% of FSWs who tested positive for HIV also tested positive for syphilis. The highest prevalence of HIV was found in the capital city, Port Louis, and in Plaines Wilhems.

High-risk sexual behaviors:

Half of FSWs had their sexual debut at 15 years and half began selling sex at 18 years old. Sixty one percent of FSWs reported being married or living in common. Although the majority of FSWs reported one non-paying sex partner in the past three months, only 38.5% of FSWs reported using a condom with non-paying partners. In addition, even though FSWs reported a median of 20 partners in the past three months, condom use at last sex with a paying partner was much higher (86.8%) than with a non-paying partner.

High-risk alcohol and drug use practices:

The majority of FSWs report drinking alcohol but not every day and almost 30% of FSWs reported using drugs in the previous three months. The use of drugs and alcohol can undermine the ability to make good decisions about safe sex. Almost 40% of FSWs reported ever injecting drugs and among those, 30.5% have done so in the previous three months. Of extreme concern is that more than half of those injecting drugs are infected with HIV and 90% are infected with HCV.

Low HIV transmission and STI knowledge:

Only 27% of FSWs were able to correctly describe any signs or symptoms of STIs in men and 20% were able to describe any signs or symptoms of STIs in females. Thirty

FSW Biological Results

- HIV prevalence is 28.9%.
- HCV prevalence is 43.8%.
- Syphilis prevalence is 5.1%
- No one tested positive for HBV
- Among FSWs who tested positive for HIV, 89% also tested positive for HCV infection
- HIV prevalence is highest in Port Louis and Plaines Wilhems

six percent of FSWs had correct knowledge about general HIV transmission; however, knowledge was high for question regarding the mother to child transmission of HIV. Given that this population is involved in several high risk sex behaviors, education and awareness about STI and HIV risk and transmission is needed.

Low recent HIV testing and acquisition of test results:

Although 60.3% of FSWs reported ever having an HIV test, only 41.7% of them did so in the previous six months and 60.3% received their test results. Most FSWs who never had an HIV test reported that they did not know where to get a test. Given that all FSWs in this survey are at high risk for HIV acquisition and transmission FSWs should be encouraged to have frequent HIV testing and counseling by increasing the number of easily accessible testing venues.

FSWs face stigma and abuse:

One fifth of FSWs reported being discriminated against when seeking health care and housing and almost 60% received verbal abuse in the past 12 months (18% of whom receive verbal abuse daily). In addition, 17% of FSWs reported being kicked and almost 20% of FSWs reported being raped in the past 12 months. HIV prevention efforts should include education or community mobilization focused on reducing or responding to discrimination and violence towards FSWs.

The FSW population size:

The FSW population size based on the multiplier methodology using data provided by both the AIDS Unit of the MOH&QH and the distribution of a unique object, and data collected during the RDS survey is estimated to be between 254 and 1320. The mean for all five estimators is 771.

Respondent driven sampling is recommended for future IBBS of FSWs.

Given the success of RDS to recruit a diverse sample of FSWs in Mauritius, it is recommended that ongoing IBBS be conducted among this population using the same methodology. This will also ensure that findings can be compared over time across studies.

BACKGROUND

The HIV Epidemic in the Republic of Mauritius

The HIV/AIDS epidemic in Mauritius is classified as 'concentrated' whereby HIV prevalence is estimated to be below 1% among women tested at antenatal clinics and above 5% among Most At Risk Populations (MARPs),¹ which comprise Injecting Drug Users (IDUs), Female Sex Workers (FSWs), and Men having Sex with Men (MSMs). National HIV prevalence is under 1% (0.97%) based on 2010 estimates using the Estimation and Projection Package (EPP) developed by UNAIDS (around 12,000 people in the population of 15-49 year olds)².

Although, it is known that injection drug use accounts for a large percentage of HIV infection in Mauritius, there are indications that heterosexual transmission is on the rise. According to the Ministry of Health and Quality of Life (MOH&QL) heterosexual HIV transmission has increased from 5.9% in 2005 to 21.7% in 2008. HIV infection appears to be largely concentrated within the 25 to 39 age groups (54.6%). The younger age groups (15 to 24 year olds) constitute 18.6% of the HIV infected population. In addition, the majority of infected females in Mauritius have been identified as housewives (44%) and FSWs (41%). Among females infected with HIV through injection drug use half of them are single, one third married and at least one quarter of them have been identified as having sold sex in exchange for money.

Very little is known about the HIV and other infections prevalence and associated risk behaviors of FSWs in the region. Sex workers often have a disproportionately high prevalence of HIV infection and they, along with their clients, are considered a core group contributing to the transmission of HIV in many countries. Sex workers, by definition, are likely to have multiple concurrent partners and are often at a social and economic disadvantage to negotiating safe sexual practices with their clients and other partners. Several countries with low HIV prevalence have shown rapid increases in HIV

¹ UNAIDS. *A framework for monitoring and evaluating HIV prevention programmes for most-at-risk populations*. Geneva, Switzerland, UNAIDS, 2008. Accessed on 25 December 2009 at: http://data.unaids.org/pub/Manual/2007/JC1519_me_Framework_en.pdf.

² UNAIDS. Accessed on 27 December 2009 at: http://data.unaids.org/pub/Report/2008/mauritius_2008_country_progress_report_en.pdf.

infection among FSWs well before similar increases are seen in the general population.³ One study conducted in 2007 in Zanzibar using respondent driven sampling, found HIV prevalence to be 10.8%, syphilis prevalence to be 1.3%, Hepatitis B (HBV) prevalence to be 5.1% and Hepatitis C (HCV) prevalence to be 1.9%. In addition, studies conducted in Eastern Africa among informal sex workers found HIV prevalence to range from 19% – 68%.⁴

Although illegal, sex work is generally tolerated in Mauritius. However, similar to many countries, FSWs are difficult to reach for research purposes due to social and legal stigma and discrimination. Very often, FSWs do not attend health care and other services, therefore increasing their risk for HIV infection and transmission. In addition, FSWs who are dependent on their income through selling sex may not have the skills or ability to negotiate the use of condoms if clients insist or offer to pay more to not use a condom.

To date, efforts to address the needs of FSWs in Mauritius have been limited. One of the few organizations in Mauritius to address the needs of FSWs is Chrysalide which operates a center of support for women with HIV, who use drug and/or sell sex. Although HIV surveillance of FSWs has been mentioned as a priority in the national HIV/AIDS strategic framework from 2007 to 2011⁵, there are no representative data to describe the HIV prevalence and associated risk behaviors among this population. Nor are there any accurate data on the size of the FSW population in Mauritius. Currently, there is no estimation about the HIV prevalence among FSWs in Mauritius. Obtaining representative data about the prevalence of HIV and other infections and associated sexual risk behaviors is essential to planning and implementing programmatic and policy responses for these populations and for providing a baseline from which to monitor epidemic trends.

³ Ghys PD, Jenkins C, Pisani E. (2004) HIV surveillance among female sex workers. *AIDS* 18(15):S33-40.

⁴ Kapiga SH, Sam NE, Shao et al. (2002) HIV-1 Epidemic Among Female Bar and Hotel Workers in Northern Tanzania: Risk Factors and Opportunities for Prevention. *JAIDS*. 29:409-7; Riedner G, Rusizoka M, Hoffmann O, et al. (2003) Baseline survey of sexually transmitted infections in a cohort of female bar workers in Mbeya Region, Tanzania. *Sex Transm Infect*. 79:382-87.; Trong T.H, Sam NE, Elisante J. et al. (2006) Human Immunodeficiency Virus Type 1 Among Bar and Hotel Workers in Northern Tanzania: The Role of Alcohol, Sexual Behavior, and Herpes Simplex Virus Type 2. *Sex Transm Dis*. 33[3], 163-169.

⁵ Mauritius MoHQoL. Mauritius National HIV/AIDS Strategic Framework 2007-2011.

The first attempt by Mauritius to study a HIV high-risk and hard-to-reach population was in late 2009, whereby the MOH&QL conducted an integrated behavioral and biological surveillance (IBBS) study among IDUs using respondent driven sampling (RDS). RDS is a chain-referral sampling method specifically designed to obtain probability-based samples of 'hidden' populations. This study began with six eligible participants who initiated the recruitment process. After providing informed consent, eligible respondents completed an interview about their injecting and sexual risk behaviors, access to and use of IDU and HIV services, HIV transmission and sexually transmitted infection (STI) signs and symptoms and knowledge and a measurement of their social network size. The interview also included questions about IDUs' visits to services which were used to estimate the size of the IDU population using several multipliers. Once the interview was completed, participants received HIV pre-test counseling and provided blood specimens to be tested for HIV, HBV, HCV and syphilis. Participants were provided test results with post-test counseling two weeks after their enrollment and those who had positive test results were referred for treatment and/or for further management at a local health facility. A diverse mix of 511 IDUs from all parts of Mauritius were recruited and tested over the course of six weeks. Data from the 2009 IBBS survey are currently being used to improve HIV and harm reduction program planning for and service delivery to IDUs. Since that study, another IBBS was successfully conducted in 2010 among 362 MSM, also using RDS.

Given the successful recruitment of IDUs and MSM using RDS in Mauritius, the MOH&QL decided to utilize this methodology and the study protocols to plan and implement a similar study among FSWs. With funding from the Global Fund to fight HIV/AIDS, tuberculosis, and malaria, the MOH&QL recruited 299 FSWs over the course of two weeks in August, 2010. Females were eligible for the survey if they reported having vaginal, anal or oral sex in the last six months with a male in exchange for money or kind, aged 15 years and older, and living in Mauritius. This report provides survey findings and offers some recommendations on how to use these data to respond to the HIV prevention and intervention needs of FSWs in Mauritius.

RATIONALE AND OBJECTIVES

In 2010, the Government of Mauritius conducted an IBBS survey among FSWs in Mauritius.

Specific Objectives

Specific objectives were to determine the prevalence of HIV, HBV, HCV, and syphilis among FSWs in Mauritius and to provide a baseline for monitoring trends in HIV and sexually and non-sexually transmitted infections prevalence.

- To assess sexual and other risk behaviours associated with HIV and STI transmission among FSWs.
- To assess health seeking behaviours, including harm reduction, condom access and voluntary counselling and testing (VCT), among FSWs.
- To describe demographic characteristics of FSWs and the nature of their high risk behaviors in Mauritius
- To estimate the population size of FSWs in Mauritius using a variety of multiplier methods.
- To develop capacity in Mauritius to strengthen national HIV/STI surveillance systems for FSWs.
- To provide information about FSWs to policy makers and services providers and thereby assist the Government of Mauritius and stakeholders in HIV and other infections strategic planning.

METHODS

Respondent Driven Sampling (RDS)

This survey used respondent-driven sampling (RDS) to recruit FSWs from throughout Mauritius (not including the sister island of Rodrigues). RDS is a variant of a chain referral sampling method which, when implemented and analyzed properly, yields data representative of the populations from which the samples were gathered⁶. Several theoretical and mathematical techniques borrowed from various disciplines (e.g., social network theory, physics, statistics, etc.) are used to develop a sampling frame and to mitigate several well known biases generally associated with chain referral methods. RDS is specifically designed to sample hard-to-reach and hidden populations such as FSWs and has also been successfully used among other HIV high risk populations, including IDUs and MSM (including in Mauritius in 2009 and 2010, respectively) and FSWs⁷.

Recruitment in RDS is initiated with a number of purposefully selected members of the study population referred to as “seeds”. After enrolling and completing the steps in the survey, each seed is given a fixed amount (usually no more than three) of uniquely numbered coupons with which to recruit peers (other eligible FSWs) into the survey. These recruited peers who also enroll in and complete the survey steps are considered the first wave of participants. Each participant in the first wave who enrolls in and completes the survey steps is then provided a fixed number of coupons with which to recruit their peers into the survey. Successive waves of recruitment continue until the sample size is reached.

Each participant is asked her social network size which is directly tied to the eligibility criteria and sets up the probability of each recruit’s selection into the sample. The self reported social network size is considered the sampling frame which is used to produce

⁶ Heckathorn DD. (1997) Respondent-driven sampling: A new approach to the study of hidden populations. *Sociological Problems*. 44 (2), 174-199; Heckathorn, DD. (2002). Respondent driven sampling II: deriving valid population estimates from Chain-Referral samples of hidden populations. *Sociological Problems*, 49(1), 11-34.

⁷ Malekinejad M, Johnston LG, Kendall C, Kerr L, Rifkin M, Rutherford G. (2008) Using respondent-driven sampling methodology for HIV biological and behavioral surveillance in international settings: a systematic review. *AIDS and Behavior*, 12(suppl. 1), 105-130.

weights for deriving estimates. Furthermore, each participant is monitored through the unique numbers on their coupons which are used to calculate who recruited whom; an essential element for analyzing data gathered with RDS methodology. The unique coupon numbers also ensure participants' anonymity by linking each participant to their questionnaire and biological test results, thereby avoiding the need to collect names, addresses or other personal information.

Sample Size Calculation

Because the IBBS is supposed to be conducted repeatedly, the sample size calculation is based on the prediction of a change over time in a specific variable of interest using the following formula.

$$n = D ((z\alpha + z\beta)^2 (p_1q_1 + p_2q_2) / (p_2 - p_1)^2)$$

The variable of interest selected to represent a change over time was condom use at last sex. However, as there are no accurate estimates for condom use at last sex among FSWs in Mauritius, a proxy estimate is borrowed from a probability based survey of FSWs conducted in Zanzibar (island nation in the Indian Ocean with a population of 1.1 million) in 2007. The estimate for condom use at last sex for FSWs in Zanzibar was 57.7%, rounded up to 60%. To detect an increase in condom use at last sex from 60% to 75% over time, using a confidence interval of 95%, power of 80% and a design effect of 2.0 (see table 1), the sample size for FSWs in Mauritius was calculated to be 176. This was rounded up to 200.

Table 1. Definitions for the sample size calculation formula to survey FSWs in Mauritius

Formula term	Calculation
DE (design effect) The design effect helps to mitigate biases associated with the sampling technique and to account for common random biases such as participants enrolling in a study more than one time and interviewer and response biases.	2
P1 (baseline) Proportion at baseline	0.6

P2 (final evaluation) Proportion expected in the next round	0.75
Z α (95%) standard error associated with a level of confidence of 95%)	1.645
Z β (80%) level of power in for the analysis	0.84
n (sample size)	176

Given that this population has never been sampled before, it was uncertain whether this sample size would be reached. Keeping in mind the limitations that may be encountered in analyzing some variables of interest with such a small sample, provisions were made to sample above the final sample size calculation, within a range of 250 to 300 FSWs.

Data collection

In Mauritius, two survey sites were used, one in Curepipe (in the center of the island) and the other in Port-Louis (the capital city of Mauritius), in order to increase accessibility by FSWs and to ensure a wider geographic spread of participants throughout the Island. Five seeds (initial recruits) were identified through key contacts and were selected to reflect diversity on a number of key characteristics, including geographic residence, age, and sex worker type.

Seeds identified for the study population were each given three uniquely coded coupons which were used in recruiting their peers into the survey. Participants who presented a valid recruitment coupon to one of the two survey sites were screened for eligibility and provided informed consent for a face-to-face interview, HIV pre-test counseling and a blood extraction for HIV, HCV, HBC and syphilis testing. Interviews were conducted in Creole by trained interviewers and took approximately 45 minutes to complete. The questionnaire collected data on socio-demographic characteristics, sexual and drug risk behaviors, HIV transmission and STI signs and symptoms and HIV knowledge, information on participants' social network sizes, as well as access and utilization of HIV

and IDU related services. Following the interview, each participant was provided a set number of coupons (not more than three coupons) to use in recruiting eligible peers. Participants received a primary compensation of 500 Mauritian Rupees (~ USD 17.50) for completing the survey and an additional secondary compensation of 300 Mauritian Rupees (~ USD 7.00) for each recruit who was eligible and consented to participate in and completed the survey. Survey completion consisted of completing the behavioral questionnaire; participants could still receive their compensation if they decided not to provide a biological specimen. After specimen collection, participants received a uniquely numbered voucher which they used to receive their test results with post-test counseling. Test results and post-test counseling were provided at the interview site on specific days, two weeks after providing a biological specimen. Those with positive test results for HIV, HCV, HBV and/or syphilis infection were referred for treatment and/or for further management. No personal identifying information was collected. To ensure confidentiality, participants' questionnaires and biological tests were identified using a unique study identification number provided on the recruitment coupons.

Tools development and staff training

The FSW IBBS protocol and final questionnaire were developed by the MOH&QL with input from the RDS FSW IBBS technical working group (TWG). The protocol and questionnaire were submitted for ethical review and approval to the MOH&QL.

Field staff, including interviewers, peer leaders, screeners, supervisors and nurses [who provided the voluntary counseling and testing (VCT)] were trained in July on seed selection and participant recruitment, ethical consent, coupon and participant tracking, the compensation process, administration of the behavioral questionnaire, collection of biological samples, biological sample processing and transport, specimen testing, and provision of biological test results and referrals to the MOH&QL. The survey commenced in the Dr F. Bouloux Area Health Centre (one of the two interview sites) in Port Louis on August 2, 2010.

Laboratory procedures

Seven milliliters (7 mls) of venous blood were collected from participants using venepuncture. Specimens were transferred every day from the survey sites to the

Virology Department, Central Laboratory, in Candos where they were tested for HIV, HBV, HCV and syphilis.

The detection of HIV P24 Antigen and antibodies to HIV1 and HIV2 detected using an enzyme immunoassay, Genscreen Ultra HIV Ag-Ab (Manufacturer: BIORAD, France). Reactive specimens were confirmed by Western Blot Assay using HIV Blot 2.2 MP Diagnostics (Singapore). Hepatitis B surface antigen (HBsAg) was detected using MONOLISA HBs Ag Ultra (Manufacturer: BIORAD, France) and antibodies to HCV were detected using Murex anti-HCV (Manufacturer: ABBOTT, Murex, South Africa). Syphilis infection was tested with IMMUTREP TPHA (Manufacturer: Omega Diagnostics, UK), a haemagglutination test for Treponema Pallidum antibodies (IgG and IgM) in serum. Reactive specimens for TPHA were also tested by IMMUTREP carbon antigen (Manufacturer: Omega Diagnostics, UK)

Size Estimation

The size of the FSW population was estimated using the multiplier method, where overlapping independent population counts can be used to extrapolate the overall population size. The assumptions for the multiplier are:

- Two overlapping data sources (specific to the group being counted)
- Population being counted must have non-zero probability of inclusion in both sources
- One data source (i.e. the survey) must be random and encompass the group in the multiplier, but can include others as well
- Second data source (multiplier) need not be random but should be specific to the group being estimated
- No individual accounted for more than once in the multiplier
- Two data sources must be independent of each other (inclusion in one not related to inclusion in the other)
- Limited in- and out-migration

This study used several approaches for gathering multiplier data.

Unique Identifier

The first approach used for the multiplier in Mauritius was the 'unique object technique'. This approach gathered the 'first multiplier' component by distributing a unique object (a cosmetic bag with "RDS study" printed on the front). These items were passed out throughout the island by outreach workers one week prior to the initiation of the RDS survey. The second multiplier was enumerated during the RDS survey by asking each participant whether they received the card holder during the distribution period.

Service Data

The second approach for the multiplier in Mauritius was through the use of 'service data'. This approach involved gathering the 'first multiplier' component by asking FSW service providers the number of one time visits by FSWs in the year previous to the RDS survey. The second multiplier was enumerated during the RDS survey by asking each participant whether they had exposure to a particular service (name of service) at least one time from August 2008 and July 2009.

Multiplier Calculation

The interviewed (encountered through both peer education contacts and the RDS survey) was used as a numerator and the number of those who were enumerated by services as having one time visits and the number of cosmetic bags distributed one week prior to the initiation of the RDS survey were used as a denominator. The mathematical formula to calculate the total size of the population was:

$$N= M/P$$

Where:

N=Estimated Size

P=Proportion of FSWs in survey corresponding to list or multiplier

M=Number of FSWs who received key chains from outreach workers before the survey or those who had exposure to a particular service during the proposed twelve months period.

Data management and analysis

Data were entered into EpiInfo. Single entry procedures, data cleaning and quality control were performed at the MOH&QL, Health Statistics Unit. Final datasets were converted to SPSS (version 13.0). Consistency checks and frequencies were performed to check validity and logic of all variables in the datasets. Hard copies of completed questionnaires were stored at the MOH&QL and referred to in order to correct any discrepancies.

Data management conducted in SPSS (version 13.0) and final recoding for this report was conducted in SPSS (version 18.0). Datasets were then converted to Microsoft Excel for final formatting before being downloaded into the RDS Analysis Tool 6.0 (RDSAT). Estimates and 95% confidence intervals (CI) were calculated using RDSAT.

Ethical considerations

In order to minimize any social risks, consultations were held prior to the start of the survey with ministry officials and key representatives from local NGOs, UNAIDS, and with members of the RDS TWG. The background, purpose, and procedures of the survey, the measures taken by the investigators to ensure confidentiality and privacy of the participants, and applicability of study findings were discussed and agreed upon at these meetings. The outcomes of these discussions were used to adjust and guide the implementation of the survey.

Study participation was voluntary and participants were informed that they were free to withdraw from the study at any time during the survey process. Following careful explanation of the survey, study staff gave eligible participants the consent form to read or, if necessary, the consent form was read to the participant by a staff member. All participants verbally stated that they understood and agreed to all of the items contained in the consent form before being enrolled in the survey. Participants were given the option to complete the interview only and decline the biological tests.

To minimize any discomfort due to the sensitive nature of the questions asked, the questionnaire was administered in a private and confidential setting. Participants could refuse to answer any specific question. All participants were provided the name and

telephone number of the local survey coordinator should they have any questions about the survey or if they believed they had been injured or mistreated as the result of their involvement in the survey.

All study data including behavioral and laboratory information were kept in a confidential manner. The survey team did not record names, addresses or other personal identifiers on the survey questionnaires nor on any of the laboratory specimens and results. In this survey, coupon identification numbers were assigned to each participant and used to link questionnaire responses to management forms and laboratory test results. After data collection, questionnaires, forms and test results were kept in a secure location in the MOH&QL offices in Port Louis.

Limitations

This survey was subject to several limitations. Because behavioral data were self-reported, social desirability bias may have resulted in the underreporting of risky sexual practices and drug use behaviors. In addition, respondents were asked to recall periods of up to twelve months when responding to some questions; therefore, the accuracy of responses may have been affected by recall bias. Finally, there were some limitations with the survey instrument that may have led to some measurement errors. It is suggested that a thorough review of the current survey instrument be conducted with persons who have expertise in survey design and data analysis and that a more extensive piloting be conducted before this instrument is used in any future IBBS. Compensation for participants is a crucial element of recruitment in RDS but it can be challenging to determine the appropriate amount for each population in a given country. If the compensation offered is too high, there is a risk of double-enrollment or of encouraging recruits to fake eligibility requirements. If the amount is too low, recruitment will not be successful. For these surveys, compensation amounts were set based on meetings with the FSW IBBS RDS TWG and some formative research with and feedback from the study population. In order to prevent double-enrollment and ensure all participants met eligibility criteria, recruits attending the survey sites were screened by a trained screener in conjunction with a peer leader with experience working with the FSW population.

Although the estimates presented here may be considered representative of the population from which respondents were recruited, the small number of values for certain variables may limit our ability to derive accurate estimates. In some cases, confidence intervals are too wide for meaningful interpretation. Further, as analysis in RDSAT depends on the integrity of recruitment chains to determine and adjust estimates for probability of recruitment, missing values may distort adjusted proportion estimates. We have attempted to correct for this in the analysis by taking special care to include missing values in the denominator for prevalence estimates when appropriate.

RESULTS

This section presents the behavioral findings and biological results from the HIV IBBS survey among FSWs in Mauritius. Data are presented in the following order:

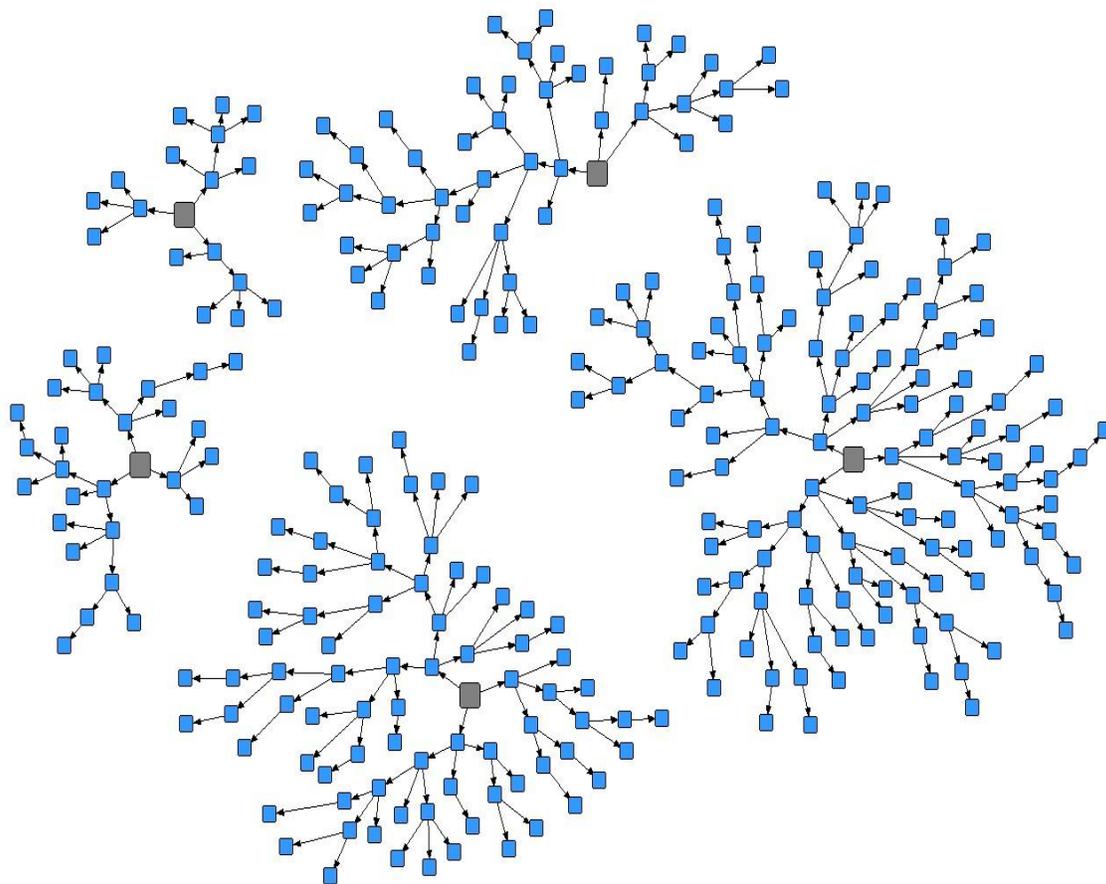
- i) Socio-demographic characteristics (page 23);
- ii) Sexual risk behaviors (page 25);
- iii) Condom use (page 26);
 - Paying sex partners (clients) (page 26);
 - Non-paying sex partners (page 26);
 - Female condom use and accessibility (page 28);
 - Male condom accessibility (page 30).
- iv) Substance use (page 31);
 - Alcohol and non-injecting drug use (page 31);
 - Injection drug use and injection behaviors (page 32).
- v) Stigma, discrimination and violence (page 33);
- vi) HIV and STIs (page 35);
 - STI knowledge, signs and symptoms (page 35);
 - HIV knowledge (page 36);
 - HIV testing (page 37);
 - HIV sources of information (page 39);
 - HIV, HBV, HCV and syphilis prevalence (page 41).
- vii) HIV prevalence by select socio-demographic factors and risk behaviors (page 42);
- viii) Population size estimation (page 43).

The text and figures provide the weighted proportion estimates as percentages, while tables additionally show the number of respondents and 95% confidence intervals around each weighted proportion estimate.

Female Sex Workers (FSWs) in Mauritius

Over the course of two weeks in August 2010, 299 (including five seeds) FSWs enrolled in the HIV IBBS survey. The maximum number of waves reached in the five recruitment chains was eight (see recruitment graph, figure 1). Recruitment was initiated with two seeds in Curepipe and three seeds in Port Louis. Seeds are identified in the recruitment graph as larger squares and only have arrow leading away from them rather than towards them. Two hundred and ten (including the three seeds) FSWs were enrolled in the Port Louis survey site and the remainder (including the two seeds) were enrolled in the Curepipe survey site.

Figure 1. Recruitment graph of the FSW sample (n=299), with five recruitment chains*, Mauritius, 2010.



**The single large gray square in each recruitment chain indicates a seed.*

Seed Characteristics

Table 1 displays some basic characteristics of each seed, as well as each seeds recruitment effort. In brief, three seeds were in Port Louis and two in Curepipe (see table 2, seed characteristics). The youngest seed was 26 years of age and the oldest seed was 42 years. Three seeds were HIV positive and two were HIV negative; one was reported residing in Black River, one in Pamplemousses, one in Port-Louis and two in Plaines-Wilhems. Seed 3 recruited the most participants (121), comprising 40.8% of the sample. Seeds 2, 3, and 5 produced the longest recruitment chains (7 waves).

Table 2. Characteristics of FSW Seeds, Mauritius, 2010

	Survey Location	Age	HIV Status	Place of residence	Maximum number of recruits♦	Maximum number of waves♦	Percent of sample
Seed 1	Port Louis	32	positive	Black River	27	5	9.4%
Seed 2	Port Louis	42	positive	Pamplemousses	79	7	26.8%
Seed 3	Port Louis	29	negative	Port-Louis	121	7	40.8%
Seed 4	Curepipe	26	negative	Plaines Wilhems	20	3	7.0%
Seed 5	Curepipe	42	positive	Plaines Wilhems	47	7	16.1%

♦Excluding seeds

Socio-demographic characteristics

Table 2 presents findings on select socio-demographic characteristics of FSWs. The median age of FSWs was 31 years (Minimum=16 and Maximum=56) and among all age categories most FSWs were between 25 and 29 years (23.7%). Just under half of FSWs reported completing primary education (48.1%) and 34.3% reported some secondary education or above. The majority of FSWs reported that their sole source of income was through sex work (81.9%); among the 18.1% who had sources of income in addition to sex work, the primary type of work performed was as a maid or cleaner (60.7%). Most FSWs reported their marital status as single (43.9%), almost 40% were married and less than 20% reported 'living in common'. Fairly equal proportions of FSWs lived alone (35.8%), with a husband or male partner (30.2%) or with parents or siblings (27.7%). Sixty-nine percent of FSWs reported providing support to a median number of three (minimum 1 and maximum 9) other persons.

Table 3. Socio-demographic characteristics of FSWs, Mauritius, 2010

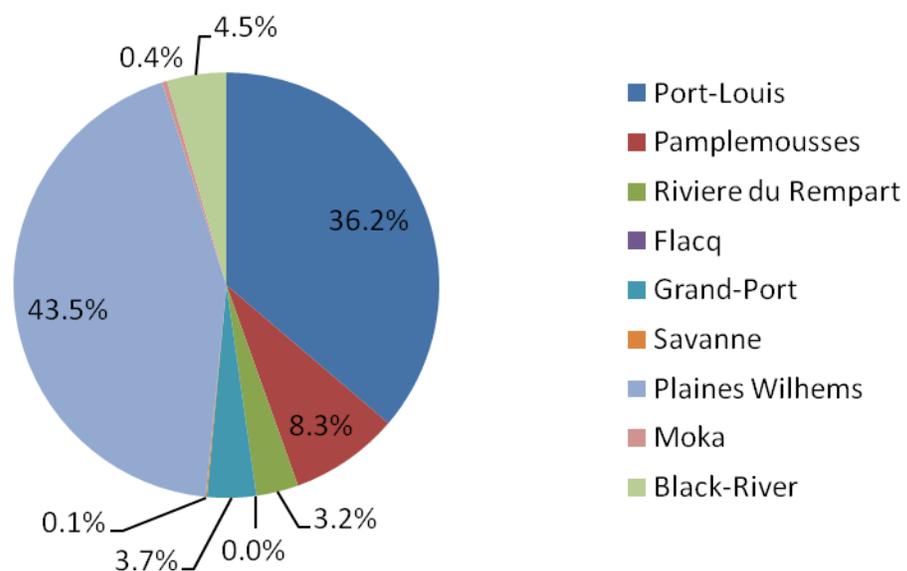
	N	%	95% CI
Age			
15-19	18	4.1	2.0, 6.9
20-24	49	15.1	10.6, 20.2
25-29	63	23.7	17.3, 30.5
30-34	43	12.4	8.9, 16.9
35-39	35	9.6	5.7, 13.2
40-44	42	15.4	10.2, 21.4
45-49	30	12.1	7.3, 16.5
≥ 50	19	7.5	4.0, 12.0
Median (min., max.) age in years, 31	31 years (min. 16–max. 56)		
Education			
Incomplete Primary	56	17.7	12.4, 23.9
Complete Primary	123	48.1	39.7, 55.4
Incomplete Secondary	82	29.4	23.5, 36.3
SC & above	18	4.9	1.9, 8.1
Earn income other than through sex work			
Yes	57	18.1	13.1, 23.4
No	242	81.9	76.6, 86.9
Types of work performed other than			
Maid/cleaner	28	60.7	42, 78.6
Restaurant/bar	4	6.4	0, 17.7
Other^	17	32.8	15.9, 50.8

Marital status			
Single	130	43.9	36.9, 51.5
Living in common	44	17.2	11.5, 23.7
Married	109	38.9	30.8, 46.2
Living situation			
Alone	98	35.8	29.3, 42.3
Husband/male partner	84	30.2	23.6, 37.8
Parents/siblings	94	27.7	21.5, 35.2
Friend	18	6.3	2.7, 9.2
Provide support to anyone			
Yes	221	69.0	61.9, 76.1
No	78	31.0	23.9, 38.1
Median (min., max.) number of persons being supported by respondent (n=221)			3 persons (min. 1–max. 9)

^Tailor, hawker, field or factory worker

FSWs were sampled from all districts of Mauritius except for FLACQ district, which is understood to be a rural area where very few FSWs reside (Figure 2). The majority of FSWs reported residing in Plaines-Wilhems (43.5%), followed by Port-Louis (36.2%) and Pamplemousses (8.3%).

Figure 2. Districts in Mauritius where FSWs Reported Residing



Sexual Risk Behaviors

Table 3 presents findings on general sexual history and behaviors among FSWs. Most FSWs were between 14 and 19 years old when they first had sexual intercourse with any partner (76.8%; median 16 years) and when they first sold sex in exchange for money (54.1%; median 18 years). Fifty seven percent of participants reported receiving money for sex within the last 24 hours. On the last day worked, 38.4% reported having two clients whereas 41.9% reported having more than two clients (median number of clients was 2, maximum number was 15). The majority of FSWs reported earning 1000 Mauritian Rupees (~34 USD) or less on the last day worked.

Table 3. General sexual behaviors among FSWs, Mauritius, 2010

	N*	%	95% CI
Age at first sexual intercourse with any partner			
<14	51	16.7	11.9, 22.0
14-19	229	76.8	70.6, 82.6
≥ 20	19	6.6	3.3, 10.1
Median (min., max) age at first sexual intercourse with any partner	15 years (min. 8 – max. 32)		
Age at first exchange of sex for money			
<14	12	4.5	12
14-19	178	54.1	178
≥ 20	109	41.4	109
Median (min., max) age at first exchange of sex for money	18 years (min. 13 – max. 50)		
Last time money received for sex			
Within the last 24 hours	173	57.3	49.6, 63.7
One day ago or more	126	42.7	36.3, 50.4
Number of clients on the last day worked			
1	56	19.6	14.0, 25.3
2	102	38.4	31.2, 45.2
3	69	22.9	17.4, 29.8
≥4	72	19.0	13.9, 24.4
Median (min., max) number of clients on last day worked	2 clients (min. 1 – max. 15)		
Amount of money earned on last day worked			
≤ 500 Rupees	92	31.8	25.4, 38.4
501-1000	94	33.0	26.3, 39.6
1001-1700	39	16.3	11.4, 21.9
≥1701	74	18.8	13.6, 24.6
Median (min., max) amount of money earned on last day worked	1000 Rupees (min. 200 – max. 6000)		

Condom use

Paying sex partners (clients)

Table 4 (below) provides data about the use of condoms and the frequency of paying sexual partners (clients). Most FSWs reported having more than ten clients in the past three months (median of 20 clients, with a maximum of 300 clients). Few FSWs reported not using a condom at last sex with a client. When asked who between the participant and the client suggested using a condom, most participants reported that condom use was suggested by themselves. With the exception of regular male sexual partners, 79.9% of participants reported that they were responsible for suggesting condom use.

Among those who did not use a condom (n=26), 56.2% of FSWs gave their main reason for not doing so was because it was “not pleasurable for the client” and 19% said it was because a condom was not available. Fifty-nine percent of FSWs reported that they always used a condom with clients in the past one month; 3.1% reported never using a condom with clients in the past one month.

Table 4. Frequency of sexual partners by partner type among FSWs, Mauritius, 2010

	N*	%	95% CI
Number of paying partners in past three months			
≤10	89	38.4	29.9, 45.8
11-20	83	27.2	21.5, 34.1
21-30	54	16.4	11.4, 21.7
≥31	73	17.9	13.2, 23.6
Median (max., min.) number of paying partners in the past three months	20 partner (min. 1 – max. 300)		
Used a condom at last sex with a client			
Yes	263	86.8	80.5, 92.0
No	36	13.2	8.0, 19.5
Person who suggested condom use at last sex			
Participant	212	79.9	73.9, 85.5
Client	37	15.2	9.8, 20.9
Joint decision between participant and partner	14	4.9	2.1, 8.6

Main reason for not using a condom at last sex with a client			
Not available	6	19.0	1.0, 37.4
Not pleasurable for client	21	52.6	36.7, 80.9
Forgot about it	2	9.2	0, 21.5
Trust partner	2	4.6	0, 12.0
Too high or drunk	2	3.7	0, 9.6
Earn more money without condom	3	10.8	0, 27.1
Frequency of condom use in past one month			
Always	170	59.2	51.7, 66.2
Sometimes	123	37.7	31.0, 44.9
Never	6	3.1	0.7, 6.0

Non-paying sex partners

Table 5, below, provides data about the use of condoms and the frequency of non-paying sexual partners. One hundred and forty FSWs reported having non-paying partners in the past three months. Among them, most reported having only one non-paying partner in the past three months. However, the median number of non-paying partners in the past three months was three, indicating that the number of non-paying partners among those with more than one was fairly high.

Among those who reported using a condom at last sex with a non-paying partner (38.5%), FSWs reported that they were the person responsible for suggesting its use rather than it being the suggestion of the partner or a joint decision. Among those who did not use a condom (n=82), 51% of FSWs gave their main reason for not doing so was because it was “not pleasurable for the partner” and 31.8% was because they “trust partner”. More than half of FSWs reported that they always used a condom with non-paying partners in the past one month.

Table 5. Condom use and frequency of non-paying sex partners of FSWs, Mauritius, 2010

	N*	%	95% CI
Number of non-paying partners in the past three months			
1	100	73.3	63.9, 83.2
2-4	24	18.0	10.5, 25.9
≥5	16	8.7	3.0, 15.1
Median (max., min.) number of non-paying male sex partners in the past three months		3 partners (min. 1 – max. 25)	

Used a condom at last sex with a non-paying partner			
Yes	52	38.5	21.4, 53.8
No	82	61.5	46.3, 78.6
Used a condom at last sex with a non-paying partner			
Yes	52	38.5	21.4, 53.8
No	82	61.5	46.3, 78.6
Person who suggested condom use at last sex			
Participant	44	85.2	74.7, 97.4
Partner	5	9.4	2.0, 17.6
Joint decision between participant and partner	2	5.3	0, 11.7
Main reason for not using a condom at last sex with a client			
Not available	4	7.4	1.3, 15.6
Not pleasurable for partner	42	51.0	36.8, 64.7
Forgot about it	4	4.8	0, 11.1
Trust partner	31	36.8	23.9, 50.4
Frequency of condom use in the past one month			
Always	74	58.6	47.9, 68.9
Sometimes	54	37.7	27.8, 47.8
Never	6	3.7	0.5, 8.9

Female condom use and access

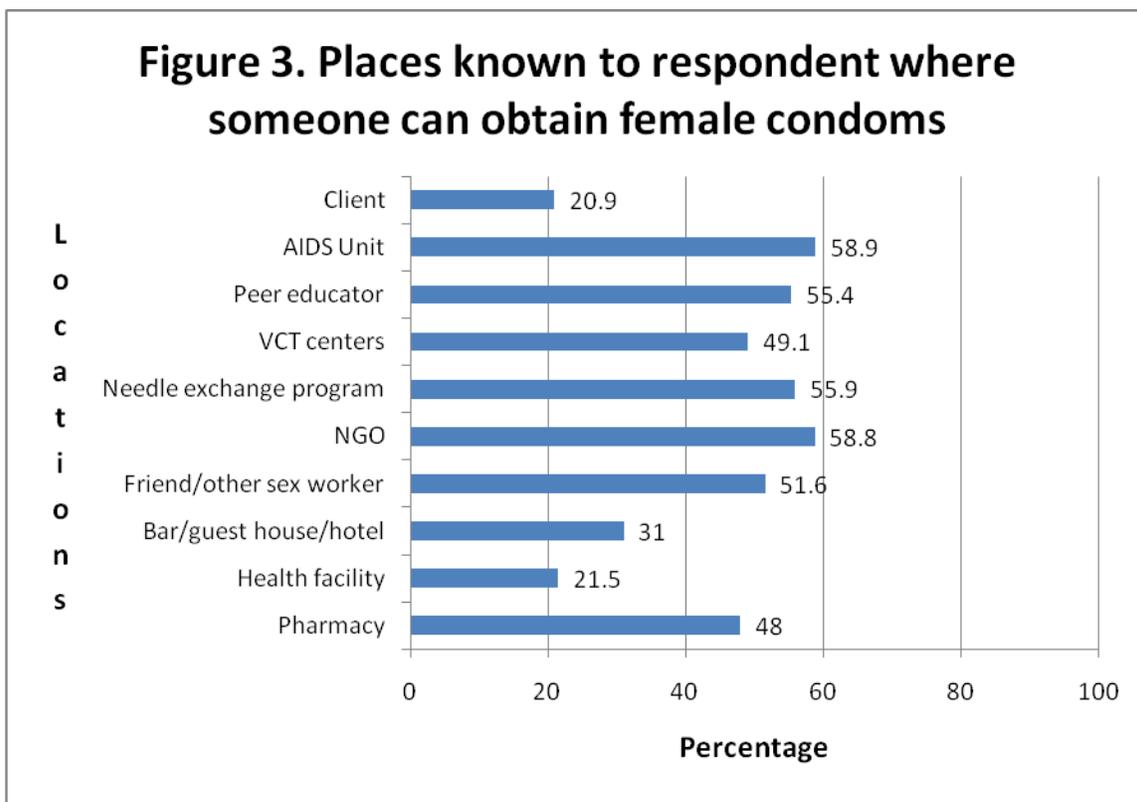
Only 29% of FSWs had ever used a female condom. Among those who ever used a female condom, 91.7% said that they did so to protect themselves from HIV/STIs, 64.5% said they did so as a form of birth control and 60.8% did so because it give them “more control than a male condom”. When FSWs who had not used a female condom were asked why (multiple responses possible), 71.5% said that they preferred to use male condoms and 56.8% said that they did not want to insert a female condom into their vagina.

Table 6. Female condom use and access among FSWs, Mauritius, 2010

	N*	%	95% CI
Ever used a female condom			
Yes	93	28.9	22.4, 35.1
No	206	71.1	64.9, 77.6
Reasons for using a female condom (multiple responses possible)			
Birth control	57	64.5	52.3, 75.8
Protection from HIV/STIs	81	91.7	84.6, 97.0
Partner requested it	45	41.6	29.9, 54.6
Gives more control than male	56	60.8	48.1, 72.6

Reasons for NOT using a female condom (multiple responses possible)			
Not available	41	22.0	15.0, 30.0
Too big	86	43.1	34.5, 52.3
Partners do not like them	39	19.6	13.3, 26.5
Do not want to insert into vagina	124	56.8	48.1, 56.4
Too expensive	15	10.1	4.9, 16.2
Never heard of it	52	27.4	19.2, 35.6
Prefer male condoms	147	71.5	63.6, 78.7
Use other birth control method	17	7.9	3.7, 12.7

FSWs were able to access female condoms from several different venues (Figure 3). When asked if they knew where or from whom someone could obtain female condoms (multiple responses possible) more than half replied that they could obtain them from friends or other sex workers (51.6%), an NGO (58.8%), the needle exchange program or caravan (55.9%), peer educator (55.4%) or the AIDS Unit (58.9%). Twenty one percent of FSWs reported being able to obtain condoms from clients.



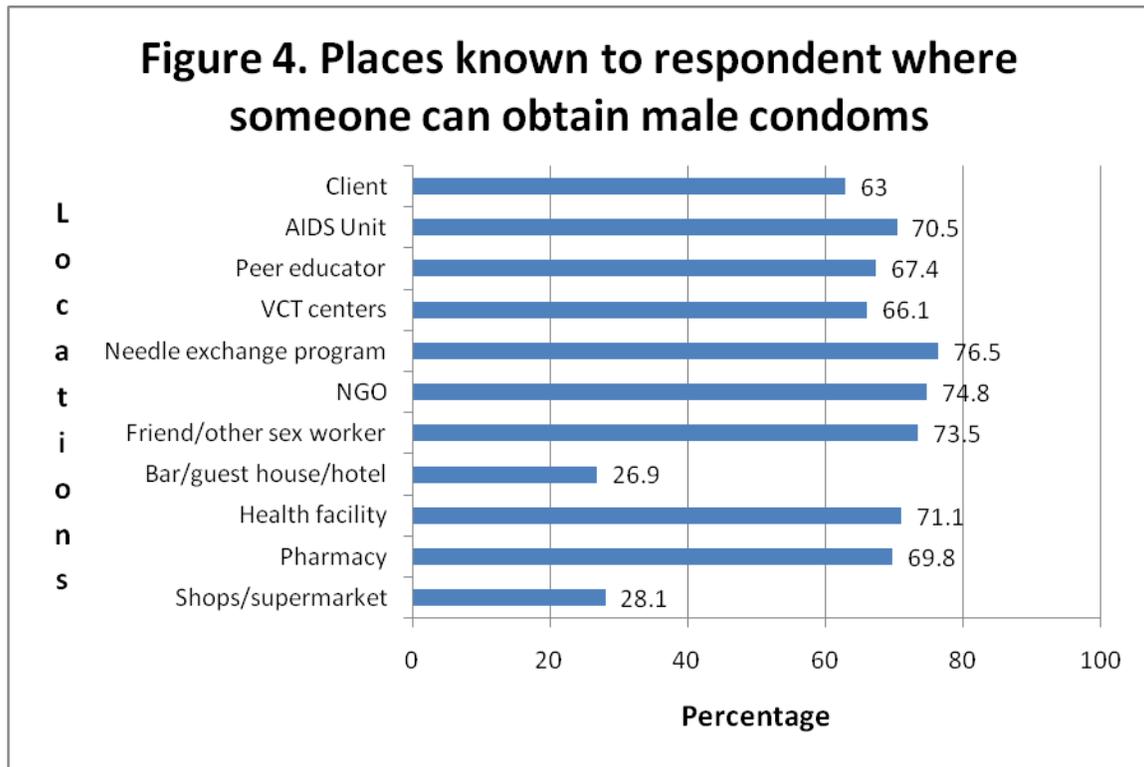
Male condom accessibility

All participants knew from where or whom to obtain male condoms (Table 7). In response to a question about whether a participant received free condoms through outreach services, peer educators or public health centers in the past three months, 91.9 of FSWs replied that they had. In response to a hypothetical question about what a participant would do if a partner refused to use a condom, 56.4% said that they would refuse and 19% said that they would accept on additional payment. Almost all (94.2%) participants reported that they were able to negotiate condom use with a sex partner.

Table 7. Male condom access among FSWs, Mauritius, 2010

	N*	%	95% CI
Aware of from where or whom one can obtain male condoms			
Yes	299	100	--
No	0	0	--
Received condoms for free through an outreach service, peer educator, public health center in past year			
Yes	279	91.9	88.0, 95.5
No	20	8.1	4.5, 12.0
Hypothetical response by respondent if a partner refused to use a condom			
Accept readily	47	17.0	10.8, 23.7
Accept after insistence	24	7.6	3.7, 11.9
Accept on additional payment	62	19.0	13.6, 26.0
Refuse	166	56.4	48.7, 63.7
Able to negotiate using a condom with a partner			
Yes	280	94.2	90.8, 97.2
No	19	5.8	2.8, 9.3

The highest proportion of FSWs (>70%) cited obtaining condoms from health facilities (71.1%), friends or other sex workers (73.5%), NGO (74.8%), needle exchange program (76.5%) and the AIDS Unit (70.5%) (Figure 4). Sixty three percent of FSWs reported being able to obtain condoms from clients.



Substance use

Alcohol and non-injection drug use

Table 8, below, displays alcohol and non-injection drug use among FSWs. Most FSWs reported drinking alcohol (73.5%, no time reference) but only 12.7% reported doing so every day. Among the 28.3% of FSWs who reported using illegal non-injecting drugs in the past three months, the majority reported using marijuana (50.9%) and cough syrup (29.2%).

Table 8. Alcohol and non-injection drug use among FSWs, Mauritius, 2010

	N*	%	95% CI
Drinks alcohol (no time reference)			
Yes	214	73.5	67.2, 79.3
No	85	26.5	20.7, 32.8
Frequency of alcohol use (no time reference)			
Never	85	26.1	20.0, 32.1
Everyday	45	12.7	8.9, 18.2
At least one time a week	58	23.1	15.9, 28.5
Less than one time a week	111	38.1	31.8, 45.9
Non-injection drug use in the past three months			
Yes	86	28.3	22.5, 34.4
No	213	71.7	65.6, 77.5
Non-injection drug used in the past three months			
Marijuana	56	50.9	39.1, 63.4
Sniffing glue	5	6.4	0.9, 13.5
Ecstasy	3	5.4	0, 9.4
Codeine	22	16.0	8.8, 24.4
Cough Syrup	32	29.2	18.9, 40.2
Tranquilizers	29	22.3	13.9, 31.0
Tramal	13	10.5	5.3, 17.5

Injection drug use and injection practices

Table 9, on the following page, has information about injection drug use among FSWs. Among the 37.4% who had ever injected drugs, 39% reported injecting Subutex® or buprenorphine, an opiate narcotic which is frequently prescribed as a treatment for heroin addiction but widely abused for recreational use, and 34.7 reported injecting La Blanche (white heroin). Among the 30.5% FSWs who reported injecting illicit drugs in the past three months, the majority (59.8%) reported doing so at least once a day or

more often and 17.5% reported sharing a needle the last time they injected. When asked if they knew of services available to injecting drug users, 83% of FSWs replied that they did know of these services.

Table 9. Injection drug use and injection practices among FSWs, Mauritius, 2010

	N*	%	95% CI
Injection drug use ever			
Yes	120	37.4	29.6, 45.8
No	179	62.6	54.2, 70.4
Injection drug use ever used most often			
Brown Heroin	1	0.3	0, 0.8
Subutex®	52	39.0	28.4, 50.7
La Blanche	33	34.7	23.2, 47.1
Other	25	26.0	15.9, 36.4
Injection drug use in past three months			
Yes	99	30.5	23.6, 37.8
No	200	69.5	62.2, 76.4
Frequency of drug use in the past three			
< once a day	31	40.2	24.9, 56.9
≥ once a day	36	59.8	43.1, 75.1
Shared a needle at last injection			
Yes	23	17.5	8.7, 26.3
No	87	82.5	73.7, 91.3
Aware of injecting drug user services			
Yes	102	83.0	73.6, 92.0
No	18	17.0	8.0, 26.4

Stigma, discrimination and violence

Table 10 on the following page provides findings for stigma, discrimination and violence experienced by FSWs. The highest proportion of FSWs reported being refused employment (18.8%) or housing (18.1%) because they were perceived to be a sex worker. Fifteen percent reported being refused health care because they were perceived to be a sex worker. Among the 58.8% of FSWs who reported receiving verbal insults in the past 12 months, most reported receiving them less than once a week (73.6%) but 18.2% reported receiving them every day.

Seventeen percent of FSWs reported being hit or kicked in the past 12 months because they were perceived to be a sex worker and 19.3% of FSWs were forced to have sexual intercourse and 12% were arrested in the past 12 months.

Table 10. Stigma, discrimination and violence among FSWs, Mauritius, 2010

	N*	%	95% CI
Refused the following services in the last 12 months because of being a FSW			
Health care	53	15.0	10.5, 20.4
Employment	62	18.8	14.0, 24.3
Education	19	5.5	2.7, 9.2
Religious service	25	7.2	4.0, 11.0
Restaurant	19	5.1	2.0, 8.3
Housing	59	18.1	12.9, 23.6
Police assistance	39	9.9	6.3, 14.4
Received verbal insults in the last 12 months because of being a FSW			
Yes	166	58.8	51.6, 65.5
No	133	41.2	34.5, 48.4
Frequency of receiving verbal insults in the last 12 months			
Every day	28	18.2	11.1, 27.7
Every week	12	8.1	2.7, 14.2
Less often than once a week	93	73.6	63.7, 82.3
Hit or kicked in the last 12 months because of being a FSW			
Yes	55	16.7	11.7, 21.9
No	244	83.3	78.1, 88.3
Forced to have sexual intercourse in the last 12 months			
Yes	65	19.3	13.7, 25.4
No	234	80.7	74.6, 86.3
Arrested in the last 12 months			
Yes	36	12.0	7.7, 16.5
No	263	88.0	83.5, 92.3

HIV and sexually transmitted infections (STIs)

The tables and figures in this section provide information about STI and HIV knowledge and prevalence, as well as STI signs and symptoms, HIV testing and access to sources of information.

STI knowledge and signs and symptoms

Almost all (90.8%) FSWs had heard of STIs, defined as diseases that can be transmitted through sexual intercourse, however only 27% could accurately describe any signs or symptoms of STIs in men and 20.4% could accurately describe any signs or symptoms in women (Table 11). Among the 29.4% of FSWs who reported having signs or symptoms of an STI (genital/anal discharge/sore/ulcer) in the past 12 months, the majority (73.2%) reported that they went to a government health facility, 33.8% reported treating themselves at home. Few (3.7%) of FSWs reported going to a private health facility and roughly a quarter reported that they stopped having sexual intercourse (26.6%) and/or used condoms during sexual intercourse (25.1%). Given that the responses to this question were not mutually exclusive, FSWs may have taken more than one of these actions the last time they had a genital/anal sore/ulcer or unusual discharge.

Table 11. STI knowledge, signs and symptoms among FSWs, Mauritius, 2010

	N*	%	95% CI
Has ever heard of diseases that can be transmitted through sexual intercourse			
Yes	275	90.8	86.0, 95.2
No	24	9.2	4.8, 14.0
Ability to describe any signs and symptoms of STIs in men			
Cannot describe	209	73.0	65.4, 79.8
Can describe	66	27.0	20.2, 34.6
Ability to describe any signs and symptoms of STIs in women			
Cannot describe	219	76.6	73.8, 85.8
Can describe	56	20.4	14.2, 26.2
Has had a genital/anal discharge/sore/ulcer in the last 12 months			
Yes	78	29.4	22.1, 36.2
No	197	70.6	63.8, 77.9

Action taken last time respondent had a genital/anal sore/ulcer or unusual discharge (multiple responses possible)

Did nothing	7	7.9	2.0, 16.5
Went to government health facility	57	73.2	60.4, 85.1
Went to private health facility	3	3.7	0, 9.1
Bought drugs at a pharmacy	11	13.6	5.5, 23.0
Went to traditional healer	15	23.3	11.8, 36.4
Treated self at home	23	33.8	20.8, 48.5
Told sex partner about symptoms	13	19.1	7.9, 33.1
Stopped having sexual intercourse	14	26.6	13.6, 40.1
Used condoms during sexual	18	25.1	13.8, 37.9

HIV knowledge

All FSWs had heard of HIV, described as the virus that causes AIDS. However, just under half of FSWs had accurate knowledge about HIV transmission⁸ (Table 12). The majority of FSWs were able to answer correctly that a pregnant woman infected with HIV can transmit the virus to her unborn child (93.2%), An HIV positive pregnant woman can prevent transmission of HIV to her baby by taking antiretroviral drugs (72.2%) and a woman with HIV can transmit HIV to her newborn child through breastfeeding (93.7%).

Table 11. HIV knowledge among FSWs, Mauritius, 2010

	N*	%	95% CI
Has correct HIV transmission Knowledge			
Yes	174	48.8	41.2, 56.1
No	188	51.2	43.9, 58.8
A pregnant woman infected with HIV can transmit the virus to her unborn child			
Yes	267	90.2	85.5, 94.8
No	27	9.8	5.9, 14.5
An HIV positive pregnant woman can prevent transmission of HIV to her baby by taking antiretroviral drugs			
Yes	201	72.2	65.5, 78.7
No	82	27.8	21.3, 34.5
A woman with HIV can transmit HIV to her newborn child through breastfeeding			
Yes	268	93.7	89.4, 97.4
No	17	6.3	2.6, 10.6

⁸ Correct HIV transmission knowledge was measured by answering the following questions correctly: Can people protect themselves from HIV by using a condom every time they have sex?; Can a person get HIV from mosquito bites?; Can people protect themselves from HIV by having one uninfected faithful sex partner?; Can a person get HIV by sharing a meal with someone who is infected?; and, Can a person get HIV by getting injections with a needle that was already used by someone else?

Knows where to go to have an HIV test			
Yes	244	78.7	72.1, 84.9
No	55	21.3	15.1, 27.9

HIV testing

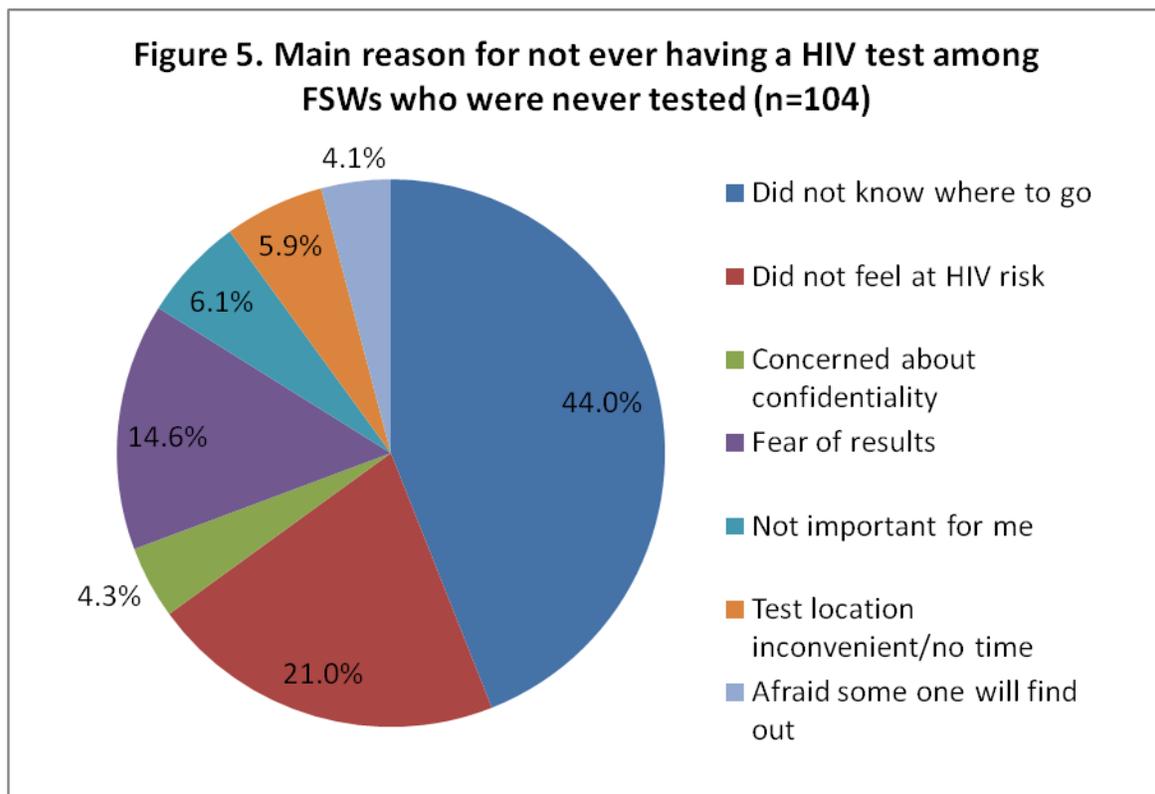
Most FSWs reported knowing where to go to have an HIV test (Table 12). Among those who reported ever having an HIV test (60.3%), 41.7% reported doing so within the past six months whereas 44.4% reported doing so more than a year ago. Sixty seven percent of FSWs reported receiving their HIV test results, among which 72.8% received positive test results. Among those who did not receive their test results, the main reason for not doing so was because they did not have the time (49%), were still waiting for results (23%) and that they were afraid of what the result would be (17.7%). Among those who had ever had an HIV test, 66.7% received their test results, among whom 72.8% tested positive.

Table 12. HIV knowledge among FSWs, Mauritius, 2010

	N*	%	95% CI
Knows where to go to have an HIV test			
Yes	244	78.7	72.1, 84.9
No	55	21.3	15.1, 27.9
Has ever been tested for HIV			
Yes	192	60.3	52.2, 68.0
No	104	39.7	32.0, 47.8
Time of last HIV test			
≤ 6 months	77	41.7	33.0, 49.9
7 -12 months	30	13.9	8.5, 20.1
> 1 year	83	44.4	35.9, 53.4
Participant received HIV test result at last testing			
Yes	127	66.7	57.5, 75.0
No	65	33.3	25.0, 42.5
HIV test result among those who received a result			
Negative	37	27.2	16.4, 38.5
Positive	90	72.8	61.6, 83.6

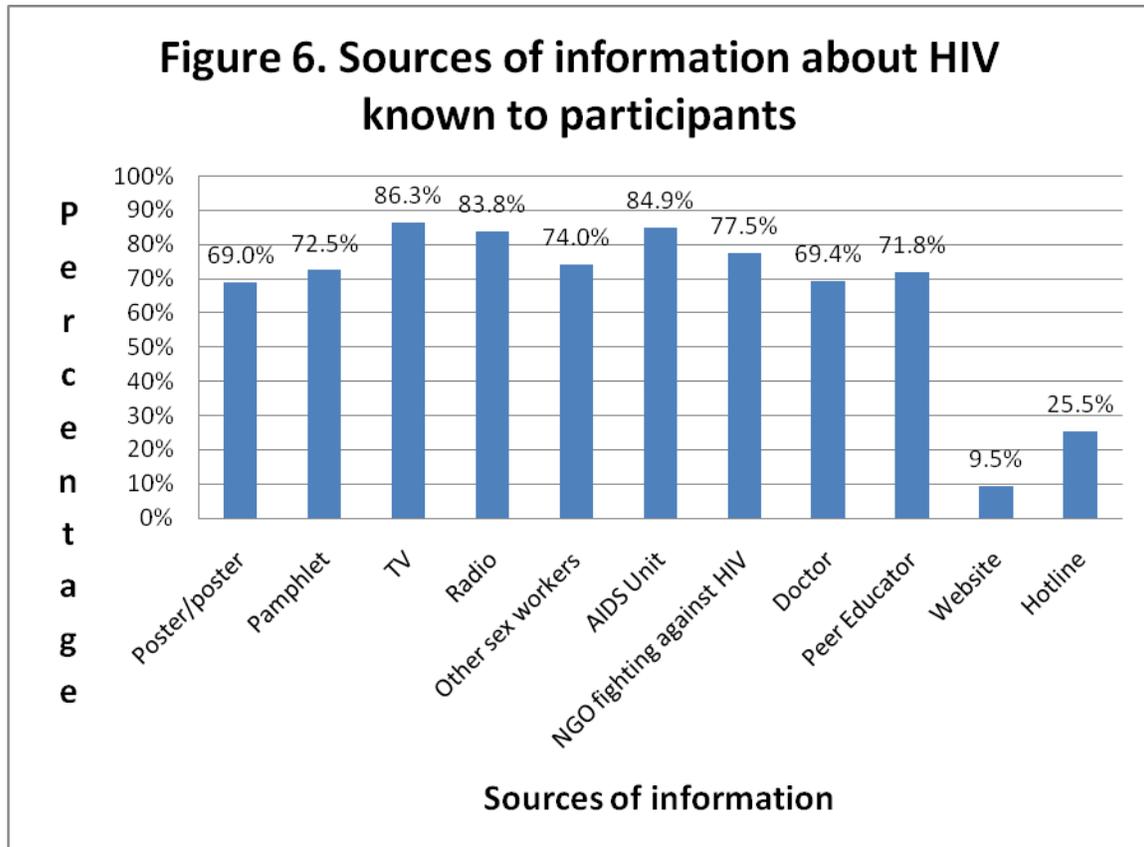
Reasons for not receiving test results			
Still waiting for result	12	23.0	8.0, 36.7
Concerned about confidentiality	1	0.3	0, 1.0
Fear of result	7	17.7	6.1, 31.4
Not important for me	5	9.5	1.7, 20.4
Afraid someone would find out	1	0.6	0, 1.8
Do not have time	33	49.0	34.5, 66.9

When FSWs who never had an HIV test (39.7%) were asked the main reason why they had never done so (Figure 5), 44% responded that they 'did not know where to go' for an HIV test, 21% did not 'feel at risk for HIV' and 14.6% were afraid of the test results.



Sources of HIV information

Respondents reported receiving HIV information from a variety of sources (Figure 6, following page). The most common sources of HIV information was through television (86.3%), radio (83.8%) and from the AIDS Unit (84.9%). Seventy four percent of FSWs reported receiving information about HIV from other sex workers and 69.4% reported receiving information from a doctor.



When asked where they would look for information about HIV/STIs or condoms, the majority of FSWs responded that they would look at an NGO fighting against HIV (80.5%), followed by the AIDS Unit (74.8%), television (72.3%), radio (72.1%) and a doctor (72.5%).

Table 13. HIV knowledge among FSWs, Mauritius, 2010

	N*	%	95% CI
Where to look if participant had questions about HIV/STIs or condoms			
Poster/poster	186	63.9	56.7, 71.0
Pamphlet	189	66.3	59.3, 73.4
TV	221	72.3	66.2, 79.1
Radio	219	72.1	65.9, 78.5
Other sex workers	211	70.8	64.0, 77.3
AIDS Unit	221	74.8	69.8, 81.3
NGO fighting against HIV	241	80.5	74.7, 85.7
Doctor	208	72.5	66.2, 78.4
Peer Educator	202	66.4	59.6, 73.2
Website	30	10.7	6.3, 15.4
Hotline	74	26.1	18.9, 32.6

HIV, Hepatitis B & C, and Syphilis prevalence

Only four participants did not provide specimens for HIV, hepatitis and syphilis testing. HIV prevalence among FSWs the 295 participants that did provide specimens, 28.9% were HIV sero-positive. Prevalence of HCV was 43.8% and syphilis was 5.1% (Table 14). No one tested positive for HBV. HIV co-infection with HCV was 89% (CI. 84.4, 97.2) (data not shown in table). Ninety two percent (CI. 84.5, 97.2) of FSWs who tested positive for HCV also reported injecting drugs in the previous three months (data not shown in table).

One hundred and fifty six (53%) of FSWs returned to the RDS interview location to receive their test results and referrals.

Table 14. Prevalence of HIV, HBV, HCV, and Syphilis among IDUs in Mauritius, 2009

Disease prevalence	N*	%	95% CI
HIV			
Positive	95	28.9	22.1, 35.3
Negative	200	71.1	64.7, 77.9
HBV			
Positive	0	0	--
Negative	295	100	--
HCV			
Positive	140	43.8	36.2, 52.3
Negative	155	56.2	47.7, 63.8
Syphilis			
Positive	13	5.1	2.4, 8.5
Negative	279	94.9	91.5, 97.6

HIV prevalence by select risk behaviors

Table 15 provides findings from a bi-variate analysis of select socio-demographic and behavioral risk variables and HCV and syphilis prevalence among FSWs who tested positive for HIV during the survey (n=95). Among those who were HIV sero-positive, HIV prevalence was highest among FSWs in Port Louis (55.8%), followed by those in Plaines Wilhems (28.9%) and Pamplemousses (7.4%). FSWs who reported being single had a higher HIV prevalence (44.1%) than women who reported living in common or being married. HIV prevalence was lower among FSWs who reported earning other income than through sex work (18.8%) compared to those who only earned income through sex work.

A higher percentage of FSWs who reported using a condom at last sex with a paying partner (client) were HIV positive, whereas a higher percentage of FSWs who reported NOT using a condom at last sex with a non-paying partner were HIV positive. Among FSWs who were sero-positive for HIV, a higher percentage reported NO presence of genital/anal discharge/sore/ulcer in the last 12 months (67.3%), had incorrect knowledge of HIV transmission (57.7%) and reported ever having had an HIV test (82.2%). Most FSWs who tested positive for HIV during the survey, reported injecting drugs in the past three months (54.7%). Eighty nine percent of FSWs who were sero-positive for HIV, were also positive for HCV. However, only 10% of FSWs who tested positive for HIV during the survey were also infected with syphilis.

Table 15. Bivariate analysis of select variables among those that tested positive for HIV prevalence among FSWs in Mauritius, 2010

Select Variables	HIV Positive		
	N	%	95% CI
District			
Port-Louis	51	55.8	40.0, 71.5
Pamplemousses	11	7.4	26.0, 14.1
Riviere du Rempart	2	1.6	0, 4.1
Flacq	--	--	--
Grand-Port	2	2.7	0, 8.5
Savanne	--	0.2	--
Plaines Wilhems	24	28.9	13.8, 42.7
Moka	2	2.0	0, 4.3
Black-River	3	1.4	0, 10.7

Marital status			
Single	40	44.1	28.8, 56.1
Living in common	23	26.1	14.2, 40.0
Married	28	29.8	18.7, 44.8
Earn income other than through sex work			
Yes	20	18.8	9.4, 29.4
No	75	81.2	70.6, 90.6
Used a condom at last sex with a client			
Yes	87	92.0	83.4, 97.7
No	8	8.0	2.3, 16.6
Used a condom at last sex with a non-paying partner			
Yes	20	33.9	10.6, 45.3
No	33	66.1	54.7, 89.4
Presence of vaginal discharge/sore/ulcer in the last 12 months			
Yes	27	32.7	18.7, 44.0
No	59	67.3	56.0, 81.3
Has correct knowledge about HIV transmission			
Yes	36	42.3	30.5, 56.9
No	59	57.7	43.1, 69.5
Has ever had an HIV test			
Yes	78	82.2	70.7, 91.0
No	16	17.8	9.0, 29.3
Injected drugs in the past three months			
Yes	55	54.7	41.9, 68.1
No	40	45.3	31.9, 58.1
HCV			
Positive	84	89.0	84.3, 97.1
Negative	11	11.0	2.9, 15.7
Syphilis			
Positive	8	9.9	2.9, 18.8
Negative	85	90.1	81.2, 97.1

Population Size Estimation

One week prior to the commencement of the survey of FSWs using RDS, 400 unique objects (cosmetic bags) were distributed to FSWs throughout Mauritius by peer outreach groups. During the survey, 120 FSWs reported receiving the unique object. The RDS weighted estimator for those who responded that they had received the unique object was 30.3%. The calculation for the population size estimation using the unique identifier method is $400/.303$ which provides a size estimation of 1320 FSWs.

In order to assess the population size estimation using service data, several organizations were asked to provide a count of one time visits by FSWs during the year previous to the survey (period from August 2009 and August 2010). During the RDS study FSWs were asked, “Since August 2009, did you use any of the following sites?” The sites listed were the Aids Unit of the MOH & QH and the non-governmental organizations of Chrysalide, Lacaz A and PILS (Prevention Information Lutte Contre Le Sida).

Population size estimations from service data ranged from 254 to 945 FSWs (Table 16). The mean for all five estimators is 771.

Table 16. Population size estimates and calculations by service provider (n=299)

	Chrysalide	Lacaz A	AIDS Unit	PILS
Number of one time visits	59	44	350	312
Percent⁹ who reported visiting	13.9% (Cl. 9.1, 19.1) n=40	17.3% (Cl. 11.8, 23.6) n=54	37.0% (Cl. 30.3, 44.0) n=113	34.3 (Cl. 27.4, 41.3) n=98
Calculation	59/.139=424	44/.173 =254	350/.370=945	312/.343=910

The variations in the population size estimations may be explained by several factors. First of all, Chrysalide most likely represents an underestimation of the FSW population size as it only accommodates a limited number of FSWs and the number of one time visits does not include those FSWs who are on the enrollment waiting list. Lacaz A is situated in the capital city of Port Louis and may represent only those FSWs working and living in and around the capital.

The estimates by the AIDS Unit of the MOH&QH (n=945), PILS (n=910) and the distribution of the unique object (n=1320) may be the most accurate estimates for the population size, especially given that the population size must be more than the total number of unique objects distributed (n=400). This is also in line with findings of a

⁹ Percentages are weighted using RDSAT 6.0

population size estimation of FSWs (n=1000) conducted in 2008 using a mapping exercise¹⁰.

DISCUSSION AND RECOMMENDATIONS

High HIV and HCV prevalence: Prevalence of HIV was almost 30%, 30 times higher than that found in the general population in Mauritius and three times higher than HIV found among FSWs in Zanzibar. Compared to other risk groups in Mauritius, HIV among Mauritian FSWs was lower than that found among IDUs (47.4%) and four times higher than that found among MSM. HCV was just over 40%, 20 times higher than that found among FSWs in Zanzibar and almost three times higher than that found among MSM (14.2%) in Mauritius, but less than half that found among IDUs (97.3%) in Mauritius. Just under 90% of HIV positive FSWs were co-infected HCV.

Formal guidelines and interventions for hepatitis prevention and management of both HCV and HCV-HIV co-infection for FSWs are needed. Guidelines and interventions should be comprehensive, including HCV education and prevention, HIV-HCV counseling, screening for HCV and referral for services where appropriate and available, promotion of safe sex, and overall integration of hepatitis prevention into HIV prevention programs. Although 91.9% of FSWs who were positive for HCV reported injecting drugs in the previous three months, HCV screening should not only be incorporated into programs targeting injecting drug users, but should also be integrated into programs targeting FSWs, many of whom may not want to be associated with IDUs. It is interesting to note that 76% of FSWs reported obtaining condoms through the Needle exchange program targeting IDUs.

Concentrations of HIV found in two areas: HIV among FSWs is concentrated in Port Louis, the capital of Mauritius, and in Plaines Wilhems (lower central part of the island), similar to the findings from a study of men who have sex with men. HIV treatment and prevention efforts for FSWs (and MSM) should be focused in these areas.

¹⁰ Cornu C., Greenall M. (2008) Analyse de la situation des populations clés les plus exposées au risque d'infection au VIH dans les pays de l'océan indien. Les consommateurs de drogues injectables, les hommes ayant des rapports sexuels avec des hommes et les professionnels du sexe aux Comores, à Maurice et aux Seychelles. UNSIDA.

FSWs are young and have low rates of education: Just over half of FSWs completed only eight years or less of schooling and 44% were 29 years and younger. In addition, half of FSWs had their sexual debut at 15 years and half began selling sex at 18 years old. Existing intervention and service programs for FSWs should examine whether young FSWs are being reached. Youth programs should enhance activities and support for young girls at risk based on the findings from this survey.

FSWs reported paying and non-paying partners and variation in condom use: Sixty one percent of FSWs reported being married or living in common. Although the majority of FSWs reported one non-paying sex partner in the past three months, only 38.5% of FSWs reported using a condom with paying partners. In addition, even though FSWs reported a median of 20 partners in the past three months, condom use at last sex with a paying partner was much higher (86.8%) than with a non-paying partner. HIV prevention counseling and interventions should be designed to raise awareness among FSWs about the risks of unsafe sexual relations with all their partners. Low condom use and the high numbers of sexual contacts reported by FSWs with both paying and non paying partners highlights several opportunities for wider HIV transmission to other sex partners and from these sex partners to the general population in Mauritius. Non-paying steady partners of FSWs may not fully perceive or know of their risk for HIV infection nor understand the need to prevent HIV transmission. These findings reinforce the need for programs to work with both FSWs and their sexual partners, including targeted prevention messages for clients and non-paying partners of FSWs.

Condoms are not 'pleasurable' for partners of FSWs. The main reason for not using condoms at last sexual intercourse with both paying and non-paying partners was that it "was not pleasurable for the partner". This underscores the vulnerability faced by many FSWs to recognize their own risk when considering the use of condoms. Internationally recognized, evidence based strategies (i.e., community mobilization, rights-based framing, advocacy, micro-finance) are needed to empower FSWs to impact decision making. Overall, prevention activities promoting condom use should include condom use empowerment and should provide practical tools to improve condom use among clients and other sexual partners of FSWs

High risk alcohol and drug use practices: While the majority of FSWs reported that they drink alcohol, few reported doing so every day. However, further information is needed to determine the quantities of alcohol consumed and types of drinking behaviors (i.e., binge vs. casual drinking) practiced by FSWs. Almost 30% of FSWs reported using drugs in the previous three months. It is well known that drugs and alcohol undermine the ability to make good decisions about safe sex. Given the findings here, it is suggested that more questions measuring the scope of alcohol and drug use behaviors be incorporated into the next round of an IBBS or into a special study.

Many FSWs are injecting drugs. It is concerning that almost 40% of FSWs reported ever injecting drugs and among those, that 30.5% have done so in the previous three months. Of extreme concern is that more than half of those injecting drugs are infected with HIV and 90% are infected with HCV.

Interventions for FSWs who inject drugs need to be designed to account for the overlap of high-risk sexual and injection drug using networks and should include condom and lubricant distribution, STI testing and treatment, HIV counseling, testing, care and treatment, and integrate linkages to injecting drug use services, including evidence-based risk reduction programs such as syringe exchange and opiate substitution therapy. In addition, a scaling up of current programs such as those offered by Chrysalide that address the special economic, social and health needs of women, is urgently needed.

FSWs report stigma and forms of abuse. One fifth of FSWs reported being discriminated against when seeking health care and housing and almost 60% received verbal abuse in the past 12 months (18% of whom receive verbal abuse daily). In addition, 17% of FSWs reported being kicked and almost 20% of FSWs reported being raped in the past 12 months. HIV prevention efforts should include education or community mobilization focused on reducing or responding to discrimination and violence towards FSWs.

Low knowledge of HIV and STIs: Although most FSWs had heard of diseases that can be transmitted through sexual intercourse, only 27% were able to correctly describe any signs or symptoms of STIs in men and 20% were able to describe any signs or

symptoms of STIs in females. Almost 30% reported having any genital sore/ulcer or unusual discharge in the last 12 months. Not knowing the correct signs and symptoms of STIs in males or females may result in FSWs neither recognizing an infection on a sexual partner nor seeking advice and treatment when infected, thereby increasing the risk of acquiring or transmitting STIs. Systematic screening for STIs should be integrated into programs providing services to FSWs; health facility-based services should consider including systematic physical examinations for STIs in people known or suspected to be FSWs since signs or symptoms may neither be self-recognized nor reported.

Recent HIV testing is low: Although 60.3% of FSWs reported ever having an HIV test, only 41.7% of them did so in the previous six months and 60.3% received their test results. The main reason why FSWs did not ever get an HIV test was that they did not know where to go. Given that all FSWs in this survey are at high risk for HIV acquisition and transmission FSWs should be encouraged to have frequent HIV testing and counseling by increasing the number of easily accessible testing venues.

HIV VCT for FSWs could be addressed in several ways: (a) increase awareness about the importance of being tested and the alternatives available if found to be HIV positive; (b) increase accessibility of VCT services to FSWs through mobile services that can reach non-traditional locations for those who may have fear or other concerns about accessing public or private health facilities; (c) promote the use of existing services, with additional training for counselors on how to receive and provide quality VCT services for this population.

Potential spread of Syphilis: Syphilis prevalence was 5.1% among FSWs, the same as that found among MSM (5.0%) and two times higher than that found among IDUs (2.7%) in Mauritius. Monitoring STIs, especially those that result in genital ulcers, among FSWs is essential as STIs are easily transmitted to sexual partners and associated with increased sexual HIV transmission¹¹.

¹¹ Wasserheit J. (1999) Epidemiologic synergy interrelationships between human immune virus infection and other sexually transmitted diseases. *Sex Transm Dis.* 75(1): 3–17; Dickerson MC, Johnston J, Delea TE, et al. (1996) The causal role for genital ulcer disease as a risk factor for transmission of Human Immunodeficiency Virus: An application of the Bradford Hill Criteria. *Sex Transm Dis.* 23(5):429-440.

In this study all participants were encouraged to return to the study location to receive their test results and then were referred elsewhere for treatment and follow-up. In future studies where there is an opportunity to capture and treat study participants who either have or are suspected of having syndromic treatment an easily curable infection such as syphilis, all efforts should be made to provide the necessary treatment. Furthermore, given that syphilis was found in a relatively small number of participants, on-site treatment would not expend many resources.

The FSW population size: The FSW population size based on the multiplier methodology using data provided by both the AIDS Unit of the MOH&QH and the distribution of a unique object, and data collected during the RDS survey is estimated to be between 910 and 1320.

Conclusion

To conclude, study findings clearly identify and confirm the need for the establishment and expansion of programs targeting FSWs in Mauritius. Currently there are limited services specifically targeting FSWs. These results support the need to develop a minimum package for prevention, care, and treatment of HIV infection, provided in settings that are easily accessed by and comfortable to FSWs. As described earlier, this package should build on existing services and integrate important messages on how to reduce sexual and drug use risk, particularly among individuals that engage in multiple risk behaviors. In addition, when designing interventions, it is crucial to address the important role that clients and other partners of FSWs play in the spread or prevention of HIV transmission. Where possible, prevention programs should be expanded to include male clients and other sexual partners of FSWs. Finally, continued condom distribution, routine STI screening and treatment, and linkages to appropriate HIV care and treatment services should be included. Most of the HIV infection among FSW is concentrated in two geographic areas of Mauritius: Port Louis, and Plaines Wilhems. If resources are limited, targeted risk reduction for FSWs should be directed to these areas.

Any scale up of programs and services will need to be appropriately defined and adapted according to the unique context and risks identified for each population, endorsed by appropriate stakeholders in Mauritius, and once implemented, monitored appropriately.

This was the first use of RDS among FSWs in Mauritius and by all accounts this sampling methodology worked well in the population of FSWs. This first round of an IBBS survey conducted among FSWs in Mauritius successfully captured a diverse sample of FSWs serving as a foundation for the establishment of a HIV surveillance system. This baseline survey has provided important epidemiological data to better understand the current context of the HIV epidemic in Mauritius and should be used by policy makers to prioritize where to target their resources for HIV prevention. IBBS should be incorporated into an on-going surveillance strategy whereby surveys on HIV and other infections prevalence and associated risk behaviors are implemented every two to three years using the same sampling methodology (RDS) to monitor trends, identify and respond to failures and measure successes.