



**Depression and HIV risk among female sex workers
in Nelson Mandela Bay Municipality, South Africa:
Results from a respondent-driven sampling study**

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*This is dedicated to my father, Fred, who left before I started this MPH degree, and
my son, Benjamin, whom arrived midway through it.*

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PREAMBLE

Abstract

Sex workers have a higher risk of acquiring and transmitting HIV as a result of social, structural, biomedical and behavioural factors. Many recent studies have highlighted that sex workers and other key populations experience higher levels of depression compared to the general population. Evidence is also emerging that mental health issues such as depression are related to HIV risk behaviour as well as the social and structural factors that leave sex workers vulnerable to bio-behavioural risks. The study protocol is described in **Part A** of this mini-dissertation. The study from which these data were derived is discussed in detail. Particular attention is placed on the use of respondent-driven sampling as a probabilistic method to estimate population proportion for hidden populations. The primary outcome, depression, and how it is measured through the Patient Health Questionnaire 9, is discussed in detail. The objective of measuring the prevalence of depression and assessing how it relates to risk factors is noted. The protocol argues that most research on sex workers focuses only on social, structural and bio-behavioural risk factors and rarely includes intrapersonal factors such as mental health. Based on this gap, it is argued that this research will help elucidate how depression, as an intrapersonal factor, relates to HIV risk. The literature review in **Part B** expands the argument that mental health in general and depression in particular are not given the attention they deserve as there are very few studies that measure mental health variables and even fewer that attempt to make any link between mental health, bio-behavioural risk and social vulnerabilities. The journal article in **Part C** offers empirical evidence that depression is higher among female sex workers than the general population and that depression is strongly associated with bio-behavioural and social risk factors. The article argues for more integration of mental health in research and programme implementation among sex workers.

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Acronyms and abbreviations

aOR	adjusted odds ratio
aPR	adjusted prevalence ratio / adjusted prevalence risk ratio
ART	antiretroviral treatment
BBRF	biomedical and behavioural risk factors
BCI	bootstrapped confidence interval
CI	confidence interval
FSW	female sex workers
HIV	human immunodeficiency virus
IDU	injecting drug use
MSM	men who have sex with men
OR	odds ratio
PHQ-9	patient health questionnaire 9
PR	prevalence ratio / prevalence risk ratio
PrEP	pre exposure prophylaxis
PWID	people who inject drugs
RCT	randomised control trail
RDS	respondent-driven sampling
SSF	social and structural factors
STI	sexually transmitted infection
TB	tuberculosis

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PART A: RESEARCH PROTOCOL

Depression and HIV risk among female sex workers in Nelson Mandela Bay Municipality, South Africa: Results from a respondent-driven sampling study

PURPOSE OF STUDY

The aim of this secondary analysis of a cross-sectional respondent-driven sampling (RDS) study is to describe the prevalence of depression among female sex workers (FSW) as well as the relationship between depression and social and bio-behavioural HIV transmission and acquisition drivers. RDS is a sampling method based on chain referral methodology, which allows for the extrapolation of population proportion estimates for hard to reach populations where random sampling is not viable. The objectives of this study are to:

1. Estimate the prevalence of depression among FSWs in Nelson Mandela Bay Municipality.
2. To examine the relationship between depression and social and structural drivers of HIV transmission.
3. To examine the relationship between depression and behavioural and biomedical drivers of HIV transmission.

BACKGROUND

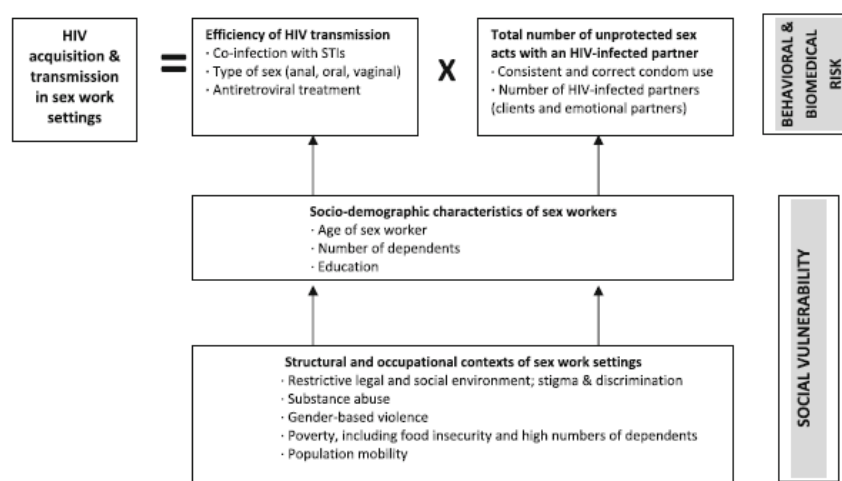
Sex workers are identified as a key population in the South African National Strategic Plan for the Treatment of HIV and AIDS – whereby a key population is defined as a group of individuals that are most likely to be exposed to HIV and most likely to transmit it [1,2,3]. Globally, sex workers are 10-20 times more likely to be infected with HIV compared to the general population [4]. The HIV prevalence for FSWs in South Africa was estimated in 2012 to be as high as 59.8% [4]. The SACEMA modes of transmission modelling report estimated that as much as 20% of the annual incidence of HIV could be directly (6%) or indirectly (14%) attributed to sex workers [5]. It is estimated there are 153,000 sex workers in South Africa [1,2]. Several recent studies

added to our knowledge of HIV prevalence amongst FSWs in South Africa. One such study found that the prevalence of HIV is generally very high, with variation between cities – with the City of Cape Town estimated at 39.7%, Durban estimated at 53.5% and Johannesburg with the highest estimate at 71.8% [6]. The study which this secondary analysis is based on found that FSWs in Port Elizabeth have a HIV prevalence of 61.5% (RDS-weighted) [7].

Factors associated with HIV transmission

The role of behavioural and biomedical drivers of HIV transmission among sex workers, especially FSWs, has been well defined, and much research on this is available within many settings across the world. A systematic review on HIV transmission among FSWs in sub-Saharan Africa highlights important biomedical, behavioural, social and structural drivers [8]. The following multilevel conceptual model was used in the afore-mentioned meta-analysis to illustrate these drivers (figure 1). Notably absent from this model is mental health, which may play an important mediating or moderating role between the social and structural drivers and the behavioural and biomedical risks.

Fig. 1 Multilevel model of the contextual, socio-demographic, behavioral and biomedical risk factors for HIV infection in sex workers



The behavioural and biomedical risk factors discussed in the meta-analysis include condom use, number of clients, years in sex work, STIs, and sexual practices such as anal sex. Clients often refuse to use condoms and pay sex workers more to not use a condom. Alcohol and drug use is also a factor, with approximately 50% of FSWs in one study from Pretoria, South Africa, not being able to negotiate condom use

effectively due to intoxication [9]. Heavy or binge drinking has been found to significantly increase the risk of inconsistent condom use, exposure to violence and the acquisition of STIs. Anal sex is an important risk factor, with one study estimating an increased risk of HIV acquisition of 3.5 times – compared to those not practising anal sex [10]. Another study with 1,799 sex workers (male, female and transgender) in South Africa found that unprotected sex was 2.1 times (95% CI 1.2-3.7) as likely, if the sex worker engages in daily or weekly binge drinking [11].

Social drivers include social marginalisation, stigma, and barriers to access of health services, violence – both physical and sexual, and access to condoms. These have been found to be closely associated with HIV transmission [8]. The role of structural factors has also been highlighted in recent years as mediating HIV transmission risk [12]. A meta-analysis and modelling study found that 33-46% of new HIV infections in all settings over a 10-year period could be averted by decriminalizing sex work. They further found that peer-led prevention services as part of community empowerment could reduce new infections by 20% (uncertainty interval 8-36%). The reduction of violence against FSWs was also found to lead to a significant decrease in HIV infections in all settings. This study shows that multi-pronged structural and community empowerment-based interventions are needed to reduce HIV incidence. Another meta-analysis looked at the relationship between community empowerment and behavioural and biomedical drivers of HIV transmission [13]. They found two studies that showed a protective effect against HIV acquisition (OR 0.84, 95% CI 0.7-0.98), while two other studies demonstrated a protective effect against STIs (OR 0.51, 95% CI 0.26-0.99; 0.65, 95% CI 0.47-0.90). This meta-analysis however neglected to link community empowerment to mental health, which may help explain the causal pathway through which community empowerment decreases the risk of HIV transmission among FSWs.

Mental health and HIV transmission

Mental health has increasingly been researched and operationalised into FSWs-focussed HIV prevention programmes in recent years [1-3]. While many studies examine the prevalence of mental health issues among FSWs and other key populations, few link this to HIV transmission directly. There are several recent studies

on depression and FSWs available, with most using a cross-sectional design and so describing the complex causality between mental health, social-structural factors and behavioural factors is not possible. Mental health may be an important HIV risk mediating or moderating variable in relation to known risk factors such as substance use, exposure to physical/sexual violence, and condom use/negotiation. Many social and structural factors may increase the risk of mental health issues such as depression, anxiety and post-traumatic stress disorder (PTSD), while mental health issues may increase HIV risk behaviours such as condom use, binge drinking and drug use.

A cross-sectional study based in KwaZulu-Natal, South Africa, found that anxiety and depression among sex workers were at 78.4% and 48.1% respectively [14]. The study authors used the Patient Health Questionnaire (PHQ-9) to assess depression. They found high rates of reported interpersonal violence (72%) as well as alcohol (87.8%) and substance use (87.7%). They further noted that in spite of the high levels of psychosocial and mental health issues, only 9.7% were receiving psychological support during the time of the study, and recommended that this treatment gap be addressed. The study also noted a high prevalence of HIV (76.1%) in the sample – but no links were made between HIV transmission risk factors and mental health.

Another study based in Soweto, a large urban township in South Africa, used RDS methodology to estimate the prevalence of PTSD and depression [15,16]. The study enrolled 508 FSWs and found that severe depression was prevalent among 68.7% of the population and PTSD was estimated at 39.6%. The study found a strong link between PTSD and interpersonal violence. High levels of binge drinking (55%) were also recorded. This study endorsed the need to strengthen mental health support for FSWs, but did not overtly link mental health to HIV transmission factors.

Another recent study in Malawi assessed the prevalence of depression and PTSD in a cohort of sex workers. It found that only 8% of FSWs could be classified as likely having moderate to severe depression needing clinical treatment, but a further 49% could be seen to have mild depression. The PHQ-9 had a reported Cronbach's alpha of 0.761, which shows moderate internal consistency. A total of 8% of the sample had probable PTSD. This study also did not make any statistical link between HIV transmission drivers and mental health [17]. A study in Kolkata, India, looked at

the prevalence of depression and anxiety among 100 FSWs being treated for HIV [18]. It found a prevalence of depression of 30% and anxiety of 44%. This study examined the appropriateness of using a modified version of a screening tool, but did not examine a relationship between mental health and HIV transmission drivers.

A study on depression and unprotected anal intercourse among men who have sex with men (MSM) in South Africa found that those with depressive symptoms were significantly (OR 1.8, $p=0.001$) more likely to engage in unprotected anal intercourse – with 56% of the sample meeting the criteria for depression [19]. A similar study in Kenya used the PHQ-9 depression index to examine depression, substance use and stigma among MSM [20]. They found that 16.1% met the criteria for major depressive disorder and another 15.2% met the criteria for mild depression. This is considerably lower than what has been identified in the literature for FSWs. While the prior study made a link between HIV transmission risk behaviour and depression, the latter did not attempt to make any such link. All of the afore-mentioned studies noted that mental health issues among sex workers and other key populations are much higher compared to the general population [14-19]. This indicates that mental health is a substantive issue by itself – as well as in relation to HIV.

From the available literature it is clear that mental health is an issue among sex workers in all contexts. There is also some evidence that mental health could play a mediating role in behavioural HIV risks [19] for MSM. However, there is little evidence directly linking mental health, particularly depression, with risk behaviours and social structural drivers of HIV among FSWs. A rapid review of the available meta-analyses found that mental health is rarely mentioned when analysing and presenting drivers of HIV transmission among sex workers (table 1) [8,11,12,21,22]. For this rapid review, only recent meta-analyses on factors associated with HIV were reviewed for the number of times they mention certain social, structural and mental health keywords. All behavioural and biomedical keywords were excluded. Mental health was not mentioned, while depression was mentioned a single time. Substance use was mentioned several times, but there was no mention of how substance use and mental health are related. Violence and stigma were often mentioned without reference to mental health. Community empowerment featured the most, but there was no attempt to conceptualise any interaction between mental health and community empowerment

and how they could work together in a casual way to reduce the risk of HIV transmission risk. The study will thus seek to address this knowledge gap.

Table 1: Rapid review of meta-analyses on factors associated with HIV among FSW

Meta-analyses	Community empowerment	Violence	Decriminalization	Stigma	Mental health	Depression	Anxiety	PTSD	Substance use
Scorgie et al 2012 [8]	0	9	1	6	0	1	0	0	3
Kerrigan et al 2013 [12]	>40	2	0	3	0	0	0	0	0
Bekker et al 2015 [21]	9	10	1	7	0	0	0	0	1
Shannon et al 2015 [11]	13	>40	9	20	0	0	0	0	2
WHO 2011 [22]	3	17	0	5	0	0	0	0	8

METHODOLOGY

Study setting

The original study was based in the Nelson Mandela Bay Municipality in the Eastern Cape. Most of the study participants were recruited in Port Elizabeth, which is the primary urban centre in the Nelson Mandela Bay Municipality. Although the province is one of the poorest and most rural in South Africa, Port Elizabeth is one of the primary coastal urban centres in South Africa – with a large manufacturing sector. The following criteria for recruitment were used:

Inclusion criteria

- Female at birth and identifying as female
- 18 years or older
- Self-report of transactional sex as the primary source of income over the last 12 months
- Mentally sound and able to consent
- Presents with a coupon (RDS)
- Has provided informed consent
- Lives in Port Elizabeth

Exclusion criteria

- Transgender FSW

- Mental incapacity, e.g. alcohol or drug intoxication
- Does not have a coupon

Study design

This study is a secondary analysis of data from a cross-sectional RDS study conducted in 2014/15 by John's Hopkins University (JHU), the Human Science Research Council (HSRC), and TB HIV Care [7,23,25]. A thorough overview of RDS is provided under the sampling and recruitment section. The student investigator conducting this secondary analysis was added to the original protocol approved by the JHU ethical board as a student investigator via an amendment. Most of the methodology section will be paraphrased from the original protocol to give context to the original study on which this secondary analysis is based. The primary aim of the original study was to describe vertical transmission of HIV among FSWs and their children in Port Elizabeth, Nelson Mandela Bay Municipality, in order to analyse prevention from mother to child (PMTCT) service utilisation and needs. The secondary aims of this study were to describe the FSW population with reference to HIV and STI prevalence, identifying risk and mitigating factors and behaviours, and to assess the HIV and STI prevention needs of this population. The study comprised a quantitative survey as well as a health screening that was administered to FSW participants recruited through RDS. All sex workers enrolled in the quantitative study were provided with biological testing for HIV, syphilis and pregnancy. FSWs were actively referred for treatment to TB, HIV, ANC and PMTCT services, as needed.

Sampling and recruitment

A sample size of 420 FSWs was estimated to be suitable to allow for an estimation of HIV prevalence within a $\pm 5\%$ margin of error, based on the assumption that the prevalence of HIV was 40-70%. The study participants were recruited through RDS, which is a probabilistic sampling technique particularly well suited for sampling hidden and marginalised populations and key populations such as sex workers [6,7,15,16,24,25]. RDS is based on chain recruitment. The following assumption must be met for the RDS method to be valid and to allow for generalizability to the population:

- Participants must be known to each other, i.e. unknown participants may not be recruited
- The participants are part of a network
- The social networks must be connected to ensure that chain referrals are viable
- Participants can accurately communicate the size and characteristics of their networks
- Recruitment from ones network is not biased.

The study recruited initial seeds who were eligible FSWs. They were chosen based on demographic characteristics which allowed them to access different sex worker networks. These seeds were then used to start the recruitment chains. The seeds completed the survey as well as the biological testing, and were provided with three recruitment coupons to recruit additional study participants. If the newly recruited FSWs were eligible and willing to participate in the study, they were provided with recruitment training and were requested to recruit three additional participants each. Participants could only recruit other FSWs they knew personally. The new recruits had to visit the study site to complete the survey, biological testing and recruitment training. These recruitment chains continued until a sample size of 410 was recruited. This was 10 less than the 420 mentioned in the protocol, but the investigators decided the difference was negligible and no more participants needed to be recruited.

The data from the RDS were then statistically adjusted to allow for the estimation of population parameters. Each participant received a weighting based on the probability of someone with a certain demographic profile recruiting someone with a different profile and by the participants' network size [23,24]. The weighting ensures that those who are not well networked get an increased weighting to promote representability. This reduces biases associated with chain referrals, which has two major biases – the tendency to recruit people with similar characteristics to oneself and the tendency for characteristics to be over or under represented across different social networks [23,24]. Homophily, or the degree to which participants are similar on certain variables, necessitates the need to adjust the confidence interval on that variable to accommodate this bias. The second bias is corrected by adjusting the

weight of the participant based on the network size which could affect point estimates for various variables.

Research procedures and data collection

The original study followed the following procedures. A few FSWs were selected as the initial seeds to start the chain referral process. They consented and completed the interviewer-administrated questionnaire, health screening, and biological testing. Each of the seeds were provided with three coupons and trained on the RDS recruitment process. When a newly recruited participant visited the study site, they were provided with information on the study and taken through the informed consent process. Both the survey and health screening were conducted in a private room at a study site to ensure confidentiality and privacy. After consent, the participant completed the survey that was administered by a trained interviewer. After the completion of the survey, participants were provided with HIV testing and counselling as well as a health screening by a TB HIV Care counsellor and nurse. The biological testing involved testing for HIV, syphilis, pregnancy and measuring the CD4 count together with a viral load when the HIV test was reactive or they knew their status to be HIV positive. TB and STI screening were also part of the health screening procedure and if the participants had any STI symptoms they were provided with treatment on-site, as per the national guidelines at the time. Participants who had TB symptoms had sputum specimens collected and sent for testing at the National Health Laboratory Service (NHLS) for diagnosis; if positive, TB HIV Care staff ensured that the participants were linked to a health facility for the management of the disease.

Data analysis

The data will be imported into STATA 14.2 for analysis. STATA allows for the weighting of RDS data with two commands, namely *rds* and *rds_network*, where the “purpose of *rds_network* is to compute information about respondents’ recruiters that is required for *rds*... [and] the purpose of *rds* is to compute estimates of population proportions, weights, and other statistics” [24, p74].

The primary variable of interest was depression. Depression was measured with the PHQ-9 instrument. This index has been used in many different settings and

has been validated in South Africa and other countries with FSWs [14,17,20]. The index consists of 9 questions where the participant has an option of answering “not at all”, “several days”, “more than half the days”, and “nearly every day”. The answers for each index item will be scored from 0-3, with a total possible score of 27. The following validated categories will be generated with the score for analysis (see table 2). The variable will also be used as a binary variable with a cut-off score of >9, which would indicate that the FSW has moderate to severe depression. This will be used for bivariate and multivariate analysis of depression. Variables that will be analysed in comparison to the depression include demographics, work environment, stigma, policing, violence, health care access/utilisation, HIV status, condom use, ART adherence, syphilis results, alcohol use, and drug use. Data will be adjusted to estimate the population parameters.

Table 2: PHQ-9 scoring criteria

Score	Category
0-4	None / Minimal
5 – 9	Mild
10 – 14	Moderate
15 – 19	Moderately Severe
20 – 27	Severe

ETHICAL CONSIDERATIONS

Description of risk and benefits

There is minimal risk as this is a secondary analysis of data collected during a 2014/15 study. The original study had stringent controls in place to minimize any risk to study participants. There was minimal physical risk associated with the biological testing such as pain and bruising at the site of blood collection. Such risk was very rare and if such arose they would have been managed by trained nurses who supported this research activity.

There was, however, a potential risk of social and legal harm from participating in the study – as much sensitive information would be collected on the enrolled FSWs’ health, social, familial, and economic circumstances. A much larger risk would be that of having their status as sex workers and/or drug users disclosed as this could be used by law enforcement to arrest and or prosecute the participants. These risks were

largely mitigated by using unique personal identifiers and by removing all identifying information from the data. The RDS recruitment processes also protected the identity of the participants as only FSWs known to each other would have been able to recruit one another.

There was also a risk of psychological harm due to the sensitive nature of the survey questions, as well as receiving the results of biological testing that could include being diagnosed with HIV or syphilis as well as testing positive for pregnancy. This was mitigated by having a counsellor on stand-by to provide psychological counselling, support and referral. TB HIV Care also had experienced staff available to provide psychosocial and biomedical support and counselling. All study participants went through the consent process and were told that they were able to refuse to answer any question and refuse to receive any of the results from the biological testing.

This secondary analysis may yield results that could improve public health interventions for FSWs by providing evidence that mental health should be included in such programmes. The study participants in the original study received services from TB HIV Care, which included HIV testing and counselling, pregnancy testing, point of care CD4 counts, STI screening and syndromic management, and TB screening and linkage. They were also provided with a financial reimbursement to participate in the study. Each FSW received R50 to participate in the study – to reimburse them for travel to and from the study site. Each participant could also receive up to an additional R75 – R25 for each of the FSWs they recruited successfully into the study as a reimbursement for their time, as well as an additional R50 for the second visit. A total possible reimbursement of R175 was thus available for a participant who had to visit the study site twice and who recruited three eligible FSW study participants. The reimbursement level was set in consultation with the local sex worker community to avoid coercion to participate in the study – but to also reimburse the participants for lost income/resources due to their participation.

Informed consent process

The student investigator conducting this secondary analysis was added to the original registered protocol as a student investigator, through an amendment to the protocol approved by JHU's ethical board. The topic of this dissertation falls within the scope of the original study, which the participants agreed to during the informed consent

process. There are thus no ethical concerns on conducting this secondary analysis, as the student investigator is on the approved protocol and the analysis is within the scope of what the participants consented to.

In the original study, the procedure, purpose risk and benefits of participating in any of the research activities were explained to a potential participant upon entering a study site for the first time. This was done in a private room where written consent was obtained. Study participants were also informed that they could access the free TB HIV Care health services – regardless of whether they participated in the study or not. The consent form was available in both English and isiXhosa and provided for tiered consent, whereby consent for each activity was obtained. The informed consent document was stored separately from the study data and service delivery data.

Privacy and confidentiality

This is a secondary analysis in which no new data are collected, so there is no risk of privacy or confidentiality infringement. The privacy and confidentiality concerns with the original study were largely mitigated through the recruitment processes – as only FSW known to each other would have been able to recruit one another. The data collected from the quantitative survey, health screening, as well as the biological testing results were anonymised, so it is impossible to link these data directly to any of the participants. The data are currently stored on the student investigator's password-protected computer.

STUDY PLAN

Table 3 (below) provides an overview of the timeline for the secondary analysis. There will be no financial input needed for this study, as it is a secondary analysis of existing data.

Table 3: Study plan

Activity	May-19	Jun-19	Jul-19	Aug-19
Write initial protocol				
Submit protocol for review by supervisor				
Revise protocol based on recommendations				
Submit protocol to REC				
Analyse the data				
Conduct literature review				
Write manuscript				
Submit literature review and manuscript to supervisor				
Revise literature review and manuscript based on recommendations				
Submit mini-dissertation for grading				

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PART B: LITERATURE REVIEW

INTRODUCTION

Sex workers are more likely to acquire and transmit HIV [1]. A meta-analysis found that sex workers in Sub-Saharan Africa have an estimated HIV prevalence of 35.9% (95% CI 3.62-37.5%) and a pooled global HIV prevalence of 11.8% (95% CI 11.6–12.0) [1]. The need to develop effective intervention has prompted a wealth of research on sex workers over the last three decades. Most of the empirical work focussed on: i) establishing the composition and size of sex worker populations, ii) establishing the prevalence of HIV and other diseases among sex workers and to a lesser extent their sexual partners, and iii) analysing biomedical and behavioural risk factors (BBRFs). A second overlapping wave of empirical research, backed by qualitative and ethnographic work, shifted the focus toward social and structural factors (SSF) and how these influence HIV transmission – especially in relation to the established BBRFs. However, there have only been sporadic attempts by researchers and policy-makers and programme implementers to embed intrapersonal factors such as mental health within the current risk factor delimitation. It is imperative to close this gap, as intrapersonal factors could potentially affect both BBRFs and SSFs, and thus have a direct and indirect effect on HIV transmission. This literature review will evaluate what the prevalence of depression is among sex workers, as well as other key populations, and then evaluate how depression has been linked to both BBRFs and SSFs within the available literature.

OBJECTIVES

The objectives of this literature review are to:

1. Identify established HIV transmission risk factors for sex workers.
2. Ascertain the prevalence of depression among sex workers.
3. Evaluate the suitability of available depression measurement instruments.
4. Evaluate the relationship between depression and HIV risk factors.
5. Identify gaps in the literature.

LITERATURE SEARCH STRATEGY

Ex Libris Primo™ was used to search the Medline/PubMed database in order to review article titles, selected abstracts and selected full-text articles. The literature review process is detailed in figure 1. The following search terms and inclusion/exclusion criteria were used during the review:

Search terms

1. “Sex work” AND (Mental OR psychological OR Depression OR Anxiety OR Trauma)
2. “Sex work” AND (risk OR prevention OR protective) AND (HIV OR AIDS).

Inclusion criteria

- Must be a quantitative article OR systematic reviews.
- Articles must contain HIV risk factors AND/OR mental health variables AND/OR key populations.
- Articles must either reference a key population OR be relevant to measurement of mental health variables.
- Articles must be linked to one or more of the stated objectives.
- Articles must be published over the last 20 years (1999 - 2019).

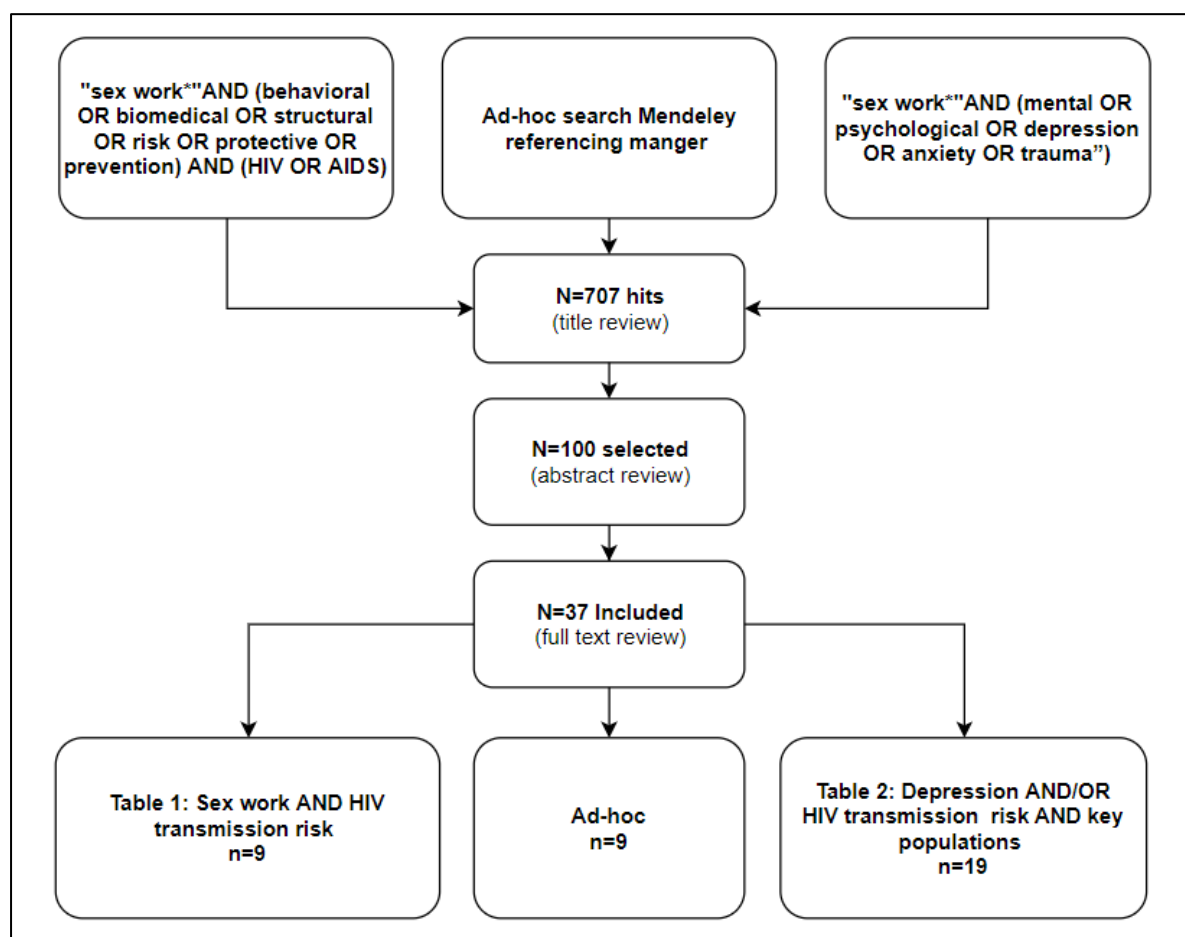
Exclusion criteria

- No full text available AND/OR not available online AND/OR not available in English AND/OR not peer-reviewed.
- Articles focusing exclusively on substance use as a mental health issue.
- No adequate link to mental health AND/OR no link with social, structural or behavioural HIV risk factors

To limit the number of articles for sex work and HIV risk, only systematic reviews, meta-analyses and modelling studies were included. Additional articles were added via non-structured searches via Mendeley™, which is open source academic reference management software with a built in literature search engine. These were included as they provided: i) more nuanced information on depression measurement

instruments, and ii) additional representation from other key populations such as men who have sex with men (MSM) and people who inject drugs (PWID) that were not included in the primary search.

Figure 1: Literature review strategy and results



Results of literature search strategy

There was 707 results, of which 100 relevant articles were selected for abstract review – of which thirty-seven (37) were included. Of the 37 articles included in the review, nine (9) systematic reviews were included to provide an overview of the existing risk delimitation among sex workers (table 1). Nineteen (19) studies, including one (1) systematic review, were included for the analysis on the relationship between depression and BBRFs and SSFs (table 2). A further nine (9) articles were added in an ad-hoc basis, as they provided additional information relevant to this review.

RISK FACTORS OF HIV TRANSMISSION

The vast majority of empirical research on HIV transmission risk among key populations is focussed on: i) biomedical and behavioural risk (BBRFs), and ii) on social and structural factors (SSFs). It is outside the scope of this review to provide a comprehensive disposition on BBRFs and SSFs – so only a brief overview is provided. Only peer-reviewed systematic reviews were included to limit the scope of this section (table 1).

Biomedical and behavioural risk factors

BBRFs are usually lumped together as there is very little distinction between the actual biomedical risk and the behaviour that causes the risk. For example, behaviour is not using a condom while the biomedical risk is the resultant possibility of HIV exposure, or the behavioural factor is taking antiretroviral therapy (ART) while the biological factor is having a suppressed viral load due to taking ART. The most common risk factor in this category is condom use, as this dictates the number of exposures to the virus. Several reviews have examined the effect of condom promotion and distribution activities [2-4]. One systematic review and modelling study found that condom use interventions and distribution had already reduced HIV incidence among sex workers by 70% in South Africa [3]. This modelling study also found that by combining the existing condom distribution strategy with pre-exposure prophylaxis (PrEP) and immediate ART initiation for HIV-positive sex workers (test and treat), it would be possible to further reduce HIV incidence by another 40% in 10 years among sex workers and their partners [3]. A systematic review which included 128 studies on behavioural interventions for sex workers in China also found significant evidence to support the effectiveness of these in reducing HIV risk transmission risk [2]. The review found that sex workers were 2.3 to 5 times more likely to use condoms more consistently post behavioural intervention compared to pre-intervention.

Table 1: Bio-behavioural and social structural risk factors

Author	Context and variables	Method	Results
Baral et al 2012 [1]	Context: Low & middle income countries Outcome: HIV prevalence and risk	<i>Systematic review and meta-analysis</i> 102 articles and surveillance reports included.	Sub-Saharan Africa HIV prev. 35.9% (36.2-37.5%) Global prev. 11.8% (11.6-12.0%)
Bekker et al 2015 [3]	Context: South Africa Exposure: Combination prevention programmes Outcome: HIV incidence	<i>Systematic review and modelling study</i> 69 articles on HIV prevention, incidence, prevalence and risk factors were included.	Condom programme in RSA already led to a 70% reduction in new HIV cases. PrEP and test and treat could likely further reduce new infections by up to 40% over 10 years.
Chow et al 2015 [2]	Context: China Exposure: Behavioural interventions Outcome: Condom use Outcome: HIV testing	<i>Systematic review and meta-analysis</i> 128 articles that provided post-intervention results on condom use were included.	Behavioural interventions are effective in promoting condom use as well as HIV testing. Sex workers were 2.3-5 times more likely to use condoms post-intervention.
Footer et al 2016 [8]	Context: Global Exposure: Policing practices Outcome: Condom use Outcome: HIV/STI infection	<i>Systematic review</i> 14 articles that dealt with policing exposures and HIV outcomes were included.	All included studies found an association between police exposure and HIV or STI infection, or a related risk behaviour.
Kerrigan et al 2013 [10]	Context: Low & middle income countries Exposure: Community empowerment Outcome: Condom use Outcome: HIV/STI infection	<i>Systematic review</i> 10 articles with community empowerment exposures and HIV/STI outcomes were included.	Community empowerment was found to have a significant protective affect against HIV transmission risks.
Scorgie et al 2012 [4]	Context: Sub-Saharan Africa Exposure: Bio-behavioural, social & structural Outcome: Condom use Outcome: HIV/STI infection	<i>Systematic review</i> 128 articles, including 34 qualitative studies, dealing with HIV risk factors were included.	HIV transmission is driven by social, structural and bio-behavioural factors.
Shahmanesh et al 2008 [5]	Context: Resource-poor setting Exposure: HIV prevention activities Outcome: STI/HIV infection	<i>Systematic review</i> 28 articles included on the effectiveness of HIV prevention activities.	Strong evidence that HIV prevention activities are effective in reducing HIV and STI infections.
Shannon et al 2015 [6]	Context: Global Exposure: Macro-structural factors Outcome: HIV infections	<i>Systematic review and modelling study</i> 87 articles that reported on structural exposures were included.	Structural factors have a significant impact on HIV transmission, with the decriminalization of sex work, eradication of violence, and community empowerment leading to large decreases in HIV incidence.
Shushtari et al 2018 [7]	Context: Global Exposure: Network structure and function Outcome: Condom use Outcome: HIV/STI infection	<i>Systematic review</i> 19 articles that reported HIV outcomes and network variables were included.	Network structure and functioning associated with significantly lower HIV transmission risk, most notably in terms of social capital and community empowerment.

The effectiveness of HIV transmission is further influenced by biomedical factors such as the type of sexual intercourse, with anal sex being the most risky, the viral load of the infected party, and the presence or absence of sexually transmitted infections [4,5]. A systematic review assessing sexually transmitted infection (STI) prevention among sex workers within resource poor settings found strong evidence suggesting that condom use and risk reduction interventions are effective in increasing STI screening and treatment as well as decreasing the incidence of STIs and HIV infections [5]. Overall, the burden of STIs among sex workers in Sub-Saharan Africa is high with 50 - 75% ever having a curable STI [4]. Sex workers often have intercourse with male clients with obvious STIs out of fear of violence or economic necessity – which elucidates the interrelationship between BBRFs and SSFs [4].

Social and structural factors

The role of SSFs has increasingly been included within the analysis of HIV transmission risk among sex workers and other key populations. The three most notable of these factors are violence, the legal context including policing, and community empowerment [4,6-8]. The mechanism through which HIV risk is influenced by violence was not discussed in detail in most of these studies, but would include direct HIV exposure through forced intercourse and intimidation or indirectly whereby violence and trauma affect intrapersonal functioning – which in turn may influence condom usage. Violence is linked to a broader system of patriarchy in which women have less power to protect themselves as well as the situational power to demand condom use [4,9]. A meta-analysis and modelling study found that the elimination of violence could reduce HIV incidence among sex workers by up to 24% (95% uncertainty interval 8-45%) over 10 years [6].

The legal context in which sex workers operate also has a strong influence on risk behaviours [3,4,6,8]. Policing, as determined by legislation, may have a profound impact on HIV transmission risk among sex workers. A modelling study and meta-analysis found that decriminalizing sex work would decrease new HIV infections by 33-46% over a 10-year period [6]. The legal context includes the macro level which plays out within communities and micro level practices of law enforcement officers. A systematic review on policing practices and HIV risk among sex workers found

significant evidence that law enforcement exposures are related to poor outcomes on condom use, health access, and STI and HIV outcomes [8]. Community empowerment is conceptualised as the formation of bonds and structures between sex workers and resources to promote health and wellbeing through peer support [3,7,10,11]. Two recent systematic reviews on community empowerment and sex work networks found a significant protective effect of community empowerment and social support against BBRFs [7,10]. The available literature however lacks a clear framework or pathway through which HIV transmission is mitigated by community empowerment.

INTRAPERSONAL FACTORS AND SEX WORK

Intrapersonal factors play a major role in our behaviours as well as how we internalize social and interpersonal exposures. Intrapersonal factors may have a significant direct and indirect influence on HIV transmission. Intrapersonal factors include established psychological disorders such as depression and anxiety, memories and experiences of trauma, cognitive ability, as well as less-tangible constructs such as self-efficiency, hope and self-stigma. This literature review will primarily focus on depression, with some mention of other psychological disorders as well, as less tangible intrapersonal constructs that were often mentioned in the studies included in table 2 of this review.

Depression among sex workers

Several recent studies have reported on the prevalence of major psychological disorders such as depression, anxiety and post-traumatic stress disorder (PTSD) among sex workers and other key populations. Nineteen (19) studies were included in table 2 as they reported on both depression and the association between depression and BBRFs and/or SSFs among key populations. Sixteen (16) of the nineteen (19) studies reported on the prevalence of depression and other major psychological disorders among key populations – twelve (12) of which reported the prevalence of depression among sex workers. Depression among sex workers ranges between 8% [12] and 78.5% [13]. Of the twelve (12) studies with depression measures among sex workers, 72% (8/12) found a prevalence of depression of over 40% [9,14-21]. Two (2) of the studies, one on MSM and one on FSWs, used respondent-driven sampling (RDS), so their estimates may be extrapolated outside of the sample [9,22], while the

other studies used non-probability sampling methods and so extrapolation is not desirable. A meta-analysis found a pooled prevalence of 62.4% among sex workers based on four studies using similar cut-off points on the same measurement instrument [21]. Two recent South African-based studies found a prevalence of moderate to severe depression in 68.7% and 48.1% of sex workers in Soweto and KwaZulu-Natal respectively [9,20]. This is five to eight times higher than depression in the general South African population, which is estimated to be approximately 9.7% [23,24]. Depression was also high among other key populations. Three (3) studies found depression between 42% to 55% for MSM [22,25-27] and one (1) study found a prevalence of depression of 84.4% among PWID in India [28]. A major challenge, however, in pooling the depression prevalence across the various studies is that no standard measurement instrument was used, with several different instruments available. The morbidity of such a debilitating but treatable psychological disorder among sex workers and other key populations alone deserves attention – even outside of the possible link to HIV transmission risks.

Other psychological disorders and issues

Depression is one of several major psychological disorders affecting sex workers. Several of the selected studies included in table 2 (below) also reported on other psychological disorders, with anxiety and PTSD being the most common [9,13,15,17-20,29]. Four (4) studies found the levels of anxiety disorder are 20% to 78% [15,18,20,29]. Three (3) studies reported on the prevalence of PTSD, with one estimate being a very low outlier at 8% [12] and the other two (2) ranging between 40% [9] and 69% [18]. Other mental health issues linked to the afore-mentioned disorders were self-harm which is estimated by one study to be 34% - 38%, and suicidal ideation that is estimated to range between 40% - 45% in two different studies [13,20]. The above-mentioned measures were not standardised, so it is not desirable to directly compare the results between the studies.

Table 2: Summary of depression and risk factors

Author (year)	Design, population, setting	Depression measure	Depression prevalence	Biomedical/behavioural risk (CI 95%)	Social, structural and interpersonal covariates (95% CI)
Ahaneku et al 2016 [22]	Cross-sectional (RDS), MSM N=205, Tanzania	PHQ-9 (cut-off>4)	Depression 46.3%	UAI RR=2.31 (1.68-3.18) Known HIV+ RR=1.84 (1.36-2.48)	Sexual abuse RR =1.53 (1.16–2.04) Physical abuse RR=1.58 (1.2-2.1)
Armstrong et al 2013 [28]	Cross-sectional, PWID N=420, India	PHQ-9 (cut-off>9)	Depression 84.4%	Needle sharing OR=4.35 (1.57-12.04)	NA*
Coetzee et al 2018 [9]	Cross-sectional (RDS), FSW N=508, RSA	CES-D (cut-off>20)	Depression 68.7%	NA*	Stigma RR=1.25 (1.10-1.42) Violence RR=4.11 (1.25-11.12) Self-esteem RR=1.14 (1.05-1.25)
Goldsamt et al 2014 [15]	Cross-sectional, MSW N=710, Vietnam	CES-D (cut-off>15)	Depression 58.2%	NS*	NA*
Gu et al 2014 [13]	Cross-sectional, FSW PWID N=200, China	DASS-21	Depression 78.5%	NA*	Stigma OR=1.08 (1.01-1.15) Family issues OR=2.6 (1.35-5.02) Abuse aOR=2.15 (1.32-3.50)
Lau et al 2010 [16]	Cross-sectional, FSW N=293, China	CES-D (cut-off>15)	Depression 53.9%	UAI aOR=2.02 UOI aOR=2.37 STI screening aOR=2.07	NA*
MacLean et al 2018 [12]	Cross-sectional, FSW N=200, Malawi	PHQ-9 (cut-off>9)	Depression 8%	NS*	NS*
Mo et al 2018 [30]	Cross-sectional, FSW N=87, China	Mental Health Inventory	Not reported	NA*	Social support r=0.25, p<0.05 Trauma r=0.41, p<0.01
Nemoto et al 2011 [14]	Cross-sectional, TGMSW N=573, USA	CES-D (cut-off>15)	Depression 48.7%	NA*	Social support p<0.05 Education p<0.05
Patel et al 2015 [33]	Cross-sectional, FSW N=2,400, India	PHQ-2	Depression 29%	Condom use aOR=1.6 (1.2-2.2)	Mobility aOR=1.9 (1.4-2.4) Violence aOR=1.5 (1.1-2.1) Police aOR=2.1 (1.5-3.1) Autonomy aOR=4.5 (3.2-5.9)

Author (year)	Design, population, setting	Depression measure	Depression prevalence	Biomedical/behavioural risk (CI 95%)	Social, structural and interpersonal covariates (95% CI)
Puri et al 2017 [29]	Cross-sectional, FSW N=692, Canada	Self-reported	Depression 35.1%	Drug use OR=4.86 (3.37-7.01) IDU OR=2.52 (1.84-3.45) Drug + sex OR=3.51 (2.54-4.86) Condom use OR=2.84 (1.87-4.30)	Trauma <18 aOR=2.90 (1.89-4.45) Venue=street aOR=1.76 (1.03–2.99) Violence OR=2.89 (1.87-3.97) Police OR=1.78 (1.31-2.42)
Poliah et al 2017 [20]	Cross-sectional, FSW N=155, RSA	PHQ-9 (cut-off>9) SRQ-20 (cut-off>6)	Depression 48.1%	NS*	Stigma p=0.036
Safren et al 2019 [25]	Cross-sectional, MSM N=210, India	CES-D (cut-off>15)	Depression 55%	UAI OR=1.97 (1.01-3.87) >Sex partners OR=1.04 (1.01-1.07) Sex work OR=5.10 (2.87-9.47)	NA*
Stulhofer et al 2017 [32]	Cross-sectional FSW, N=157, Croatia	Custom Likert scale	Not reported	STI diagnosis aOR=1.28 p<0.05 IDU aOR=1.35 p<0.05	Victimisation r=.23 p<0.01
Surratt et al 2005 [19]	Cross-sectional, FSW N=278, USA	Beck Depression Inventory	Depression 52.9%	UVI aOR=2.03 (1.25-3.31)	NA*
Surratt et al 2012 [18]	Cohort, FSW N=562, USA	Mental health GAIN	Depression 74%	Substance AOR=8.14(3.62-18.31) UVI RR=1.40 p<0.05	Trauma aOR=1.45 (1.15-1.83)
Tucker et al 2013 [26, 27]	Cross-sectional, MSM N=316, Cape Town RSA	CES-D (cut-off >15)	Depression 42.3%	UAI aOR=2.54 (1.56-4.15) Alcohol + sex aOR=1.95 (1.12-3.41) Drug + sex aOR=3.2 (1.53-6.70)	Low self-efficiency p<0.001
Wong et al 2019 [31]	RCT, FSW N=127, China	GHQ	Not reported	Condom use p<0.05	Resilience p<0.05
Yeun et al 2016 [21]	Systematic review, FSW	CES-D (cut-off >15)	Depression 62.4%	Forest plot OR=2.57 (1.87-3.54)	NA*

*NS = statistical test was done, but relationship was non-significant.

*NA = no variable was included or no variable was tested.

female sex worker (FSW), male sex worker (MSW), transgender sex worker (TGSW), men who have sex with men (MSM), people who inject drugs (PWID), injecting drug use (IDU), unprotected anal intercourse (UAI), unprotected vaginal intercourse (UVI), unprotected oral intercourse (UOI), risk ratio (RR), odds ratio (OR), adjusted odds ratio (aOR)

Other intrapersonal constructs

Other intrapersonal constructs were also operationalised and measured among key populations in some of the selected studies (table 2). These constructs are not as well defined as the major psychological disorders. They includes self-stigma [9,13], traumatic experience [29,30,32], life satisfaction [16], resilience [31], self-esteem [17] and self-efficiency [26,27,30,31]. Such measures are important because the study of mental health and HIV risk behaviour should not be limited to the presence or absence of psychological disorder, but also include other intrapersonal factors that may play an important role in mitigating or promoting HIV transmission risk behaviours. A review of these would, however, be outside the scope of this literature review, but the association between depression and some of these intrapersonal factors is included in table 2.

DEPRESSION MEASUREMENT

The two most common measures of depression is the patient health questionnaire-9 (PHQ-9) used in four (4) of the included studies [12,20,22,28] and the centre for epidemiological studies-depression scales (CES-D) used in seven (7) of the studies [9,14-16,21,25-27]. The instrument of interest for this literature review is the PHQ-9, as it is the instrument used in the study the dissertation is based on. To this end it would be important to review the validity of the PHQ-9 as well as what different cut-off scores are used, and what the rationale is for using different cut-off scores. Other methods of measurement used in the studies under review include the Beck Depression Inventory, the Mental Health Inventory (MHI-5), and self-reporting [13,18,19,29,31,33].

Validity

The validity of both the most common measures, namely the PHQ-9 and the CES-D, is well established, with a high rate of internal validity across many countries and populations [24,34-37]. A recent validation found that he CES-D is slightly more sensitive than the PHQ-9 in detecting depression across different language groups in South Africa, but the difference is negligible [37]. A validation study of the PHQ-9 in Johannesburg South Africa among public healthcare facility patients found a specificity

of 78.7% and a sensitivity of 83.4% – using a cut-off score of >9 [36]. Both measures are thus valid but comparison and pooling of estimates between both instruments is not viable.

Scoring criteria

The PHQ-9 instrument comprises 9 questions with a severity score of 0-3 for each of the questions, with 0 being “no symptoms” and three “experience daily” [12,20,22,28]. These questions are validated against the major depressive disorder DSM-IV criteria. A total score of 27 (9 * 3) is possible. Table 3 (below) provides an overview of the PHQ-9 scoring criteria. The PHQ-9 is used and reported in several different ways within the studies. It can be reported as a numerical score between 0 and 27 for linear regression – but none of the included studies in table 2 used it as such. Most studies either used it as an ordinal variable (no depression, mild, moderate and severe depression as per table 3) or a binary variable with a cut-off at either >4 for mild to severe depression or at >9 for moderate to severe depression [12,20,22,28]. Many of the studies using the PHQ-9 used either a cut off score of >4 or >9. The one study [22] using the >4 cut-off noted that it was used because it meets the threshold of mild depression so it will help identify how negative affect and behaviour is associated, while another study [28] using the >9 threshold noted that this cut-off was used as it meets the threshold for psychotherapy and antidepressant prescription being recommended.

Table 3: PHQ-9 cut-off points

Score	Category	Cut-off> 4	Cut-off>9
0-4	None / Minimal	No to minimal depression	Minimal to mild depression
5 – 9	Mild	Mild to severe depression (negative affective state as well as clinically significant depression)	Clinically significant depression
10 – 14	Moderate		
15 – 19	Moderately Severe		
20 – 27	Severe		

MENTAL HEALTH AND BEHAVIOURAL AND BIOMEDICAL RISK FACTORS

Intrapersonal factors in general, and depression in particular, may play an important role in determining, moderating or mediating risk and protective factors among key populations. Eleven (11) of the nineteen (19) studies in table 2 found a statistical link

between depression and BBRFs [16,18,19,21,22,25-28,31]. Seven (7) of these studies focussed on sex workers, while three (3) focussed on MSM and one (1) on PWID.

Condom use was the most often cited, with eight (8) of the eleven (11) studies reporting higher levels of depression being associated with lower levels of condom use. The condom use outcome was operationalised in terms of unprotected intercourse or consistent condom use. Substance use, a factor known to be associated with condom use, was also found to be significantly associated with depression as well as intrapersonal factors in five (5) of the eleven studies (11) [15,18,19,26,27,29]. Four (4) studies noted that depression is correlated with lower levels of condom use. A cross-sectional study among sex workers in China found that unprotected vaginal intercourse and unprotected oral intercourse are associated with higher levels of depression. Two (2) studies in the United States of America (USA) found that sex workers who are depressed are more likely to also engage in unprotected intercourse, with one study reporting an odds ratio of 2.03 (95% CI 1.25-3.31), while the other found a 40% (RR 1.40) increase in the risk of unprotected sex [17,18]. A randomised control trial (RCT) in China found a significant correlation between condom use outcomes and mental health for those receiving mental health interventions, compared to the control arm who did not receive such an intervention [31]. A systematic review found a pooled odds ratio (OR) of 2.57 (95% CI 1.87-3.54) in an analysis of depression and condom use in four studies. Three cross-sectional studies among MSM found that those who are depressed are also more likely to engage in unprotected anal intercourse. A study in Tanzania found that depressed MSM were over two times as likely (RR 2.31; 95% CI 1.68-3.18) to engage in unprotected anal intercourse compared to those who were not depressed [22]. Similar studies in India (OR 1.97, 95% CI 1.01-3.87) and South Africa (aOR 2.54, 95% CI 1.56-3.41) found that those MSM who are depressed are more likely to participate in unprotected anal intercourse [25-27].

Five (5) of the studies found a link between depression and substance use. A cross-sectional study in India found a large increase in the risk of needle-sharing in PWID who are depressed compared to PWID who do not have depressive symptoms (OR 4.35, 95% CI 1.57-12.04) [28]. A cross-sectional study in Canada found that sex workers who are depressed are more likely to use drugs and alcohol compared to

those who are not depressed (aOR 1.85, 95% CI 1.12-3.08) [29]. A cross-sectional study in Croatia reported that sex workers who are depressed are also more likely to be injecting drug users (aOR 1.35) [32]. A USA study found a large association between drug use and depression among sex workers (aOR 8.24, 95%CI 3.62-18.31) [18]. A study among MSM in South Africa found that those who are depressed are more likely to engage in alcohol use before sex (aOR 1.95, 95% CI 1.12-3.41) as well as drug use before sex (aOR 3.21, 95% CI 1.53-6.70) [26,27]. There is strong evidence that depression is linked to both condom use and substance use.

MENTAL HEALTH AND SOCIAL AND STRUCTURAL RISK FACTORS

Of the eleven (11) studies that were identified linking depression to BBRFs in table 2, seven also reported statistical relationships with SSFs and other intrapersonal constructs. Of the nineteen (19) studies in table 2, thirteen (13) found a statistical association between depression and SSFs. This includes social support [14,30], stigma [9,13,20], policing [29,33], violence, trauma and abuse [9,17,18,29,30,32,33], work environment and mobility [29,33], and family issues [13]. Several intrapersonal factors were also linked with HIV transmission risk and depression – namely self-esteem, autonomy, resilience and self-efficacy [9,26,27,31,33].

Experiencing violence, abuse and trauma, both physical and sexual, are significantly related to depression in eight (8) of the nineteen (19) studies included in table 2. Violence may be directly and indirectly associated with HIV transmission [18]. Violence, abuse and trauma was either measured as current exposure, or historic exposure – most often before the age of 18. The likelihood of depression was increased in almost all the studies where violence, abuse and trauma was measured. Some of these studies also found that violence, abuse and trauma was related to BBRFs such as condom use. One study found that depression and victimisation is positively correlated, and both were also positively correlated with STI infection [32]. A mediation analysis confirmed that depression partially mediates the relationship between victimisation and STI infection. Another study found a positive correlation between mental illness, trauma and unprotected vaginal intercourse [18]. Mediation analysis found that mental illness, including depression, partially mediated the relationship between trauma and unprotected vaginal intercourse. Depression and

other intrapersonal factors may thus be part of the causal pathway through which violence, abuse and trauma increase the risk of HIV transmission.

Other SSFs and intrapersonal factors were also linked to depression and HIV transmission risk. Social support was found to be protective in two (2) of the studies [14,30]. Social support is widely accepted as being a protective factor, as discussed in recent systematic reviews [7,10], but these two reviews neglected to include depression as well as other intrapersonal factors – nor did they focus on analysis of the causal pathway through which social support effects HIV transmission risk. Law enforcement exposures were also found to be associated with depression in two (2) of the studies included in table 2. Stigma was identified by three (3) of the studies as being associated with depression as well as HIV transmission [9,16,20]. Depression may thus partly explain the causal pathway through which stigma increases HIV transmission risk.

GAPS IN THE LITERATURE

In general, most studies included both BBRFs and SSFs. However, most did not include any intrapersonal measure and they rarely specified a causal pathway through which SSFs directly or indirectly influence HIV transmission. Three studies examined how intrapersonal factors mediate the relationship between BBRFs and SSFs [18,29,30], but many more of the studies could have also included such analysis. Only one study used a mental health intervention, as an intervention against risk behaviour among key populations [31]. None of the studies in table 2 examined the relationship between mental health and ART or PrEP outcomes. This may have yielded fruitful findings in terms of increasing adherence.

To conclude, research among sex workers rarely includes intrapersonal factors such as mental health. Even fewer studies look at the association between mental health and the bio-behavioural and social and structural drivers of HIV. This study will assess depression as the primary outcome in relation to social and bio-behavioural risk factors among female sex workers within the South African context, which has not been done before, to the best of our knowledge.

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PART C: MANUSCRIPT¹

Depression and HIV risk among female sex workers in Nelson Mandela Bay Municipality, South Africa: Results from a respondent-driven sampling study

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¹ In accordance with the author guidance of the PLoS One journal, **appendix 1** of this minor dissertation.

Abstract

Objective: To estimate the prevalence of depression among female sex workers in an urban coastal city in South Africa. A second objective is to analyse how depression is associated with HIV as well as social and bio-behavioural risk factors.

Methods: A cross-sectional respondent-driven sampling study was conducted. A sample of 410 female sex workers residing in Nelson Mandela Bay Municipality participated in the study. The study consisted of a questionnaire as well as biological testing for HIV and syphilis. The patient health questionnaire 9 was used to estimate the prevalence of depression. The association between social and bio-behavioural factors and depression was also measured. A multivariate log-binomial model was used to estimate adjusted prevalence ratios.

Results: The estimated prevalence of depression among female sex works was 28.6%. Depression was associated with social factors such as higher income (aPR 1.48, 95% CI 1.95-2.07), rape (aPR 1.58, 1.17-2.14), violence (aPR 1.40, 95% CI 1.05-1.87) and living with family (aPR 0.65, 95% CI 0.48-0.87). Depression was associated with a positive syphilis test results (aPR 1.51, 95% CI 1.08-2.12) and antiretroviral adherence (aPR 0.50, 95%CI 0.27-0.92). There was no statistical significant relationship between HIV status and depression.

Conclusion: These results demonstrate that depression is higher among female sex workers than in the general population. Depression was related to a range of social and bio-behavioural drivers of HIV. Mental health interventions may potentially mitigate factors associated with HIV transmission and acquisition among female sex workers.

Introduction

Sex workers are more likely to acquire HIV as a result of biomedical and behavioural risk factors as well as the social and structural conditions that leave them more vulnerable to such risks [1]. A meta-analysis found that female sex workers (FSW) globally have an estimated HIV prevalence of 11.8% (95% CI 11.6–12.0), while the estimated prevalence in Sub-Saharan Africa is three times higher at 35.9% (95% CI 3.62-37.5%) [2]. A surveillance study from South Africa estimated that 71.8% (56.5-81.2) of FSWs in Johannesburg, 39.7% (95% CI 30.1-49.8) of FSWs in Cape Town, and 53.5% (37.5-65.5) of FSWs in Durban are HIV positive [3].

While much is known about bio-behavioural and socio-structural drivers of HIV among sex workers [1-10], there is still very little known about how intrapersonal factors such as depression are associated with these drivers, especially within the South African context. A recent meta-analysis reported pooled depression prevalence of 62.4% (95% CI 59.1-65.7) and that sex workers who are depressed were more likely to report inconsistent condom use (OR 2.57, 95% CI 1.87-3.54) [11]. Only two estimates of depression among sex workers in South Africa were found. A cross-sectional study using respondent-driven sampling (RDS) in the urban township of Soweto in Gauteng Province found that 68.7% (95% CI 63.4-73.6) of FSWs had probable depression, while another cross-sectional study in the KwaZulu-Natal Province reported a prevalence of 48.1% [12,13]. This is comparatively higher than the general population in South Africa, with an estimated 1 in 10 adults ever experiencing depression in their lifetime [14,15] and a prevalence of 1 in 20 (4.9%) of young people living in informal settlements currently being depressed in South Africa [16].

The objective of this study was to estimate the prevalence of depression among FSWs in the Nelson Mandela Bay Municipality, South Africa, and to explore how depression is associated with social and bio-behavioural risk factors. It is hypothesised that FSWs who are depressed would be more likely to be exposed to social stressors such as poverty, violence and stigma, and that depressed FSWs would also be more likely to report bio-behavioural HIV risk factors.

Methods

Study population and setting

This cross-sectional respondent-driven sampling (RDS) study took place during 2014 and 2015 in Nelson Mandela Bay Municipality, Eastern Cape. The Eastern Cape has the third highest HIV prevalence in South Africa among those 15 to 49 years old and is estimated at 25.2% (95% CI 19.8-31.5) [17]. The Eastern Cape is a mostly rural province, with large industrial urban coastal cities. This study was based in Port Elizabeth, the most populous city in the Eastern Cape Province. The study was conducted by the John Hopkins University (JHU) School of Public Health, the Human Science Research Council (HSRC), and TB HIV Care, a non-profit organisation. The study was linked to TB HIV Care's sex work programme in Port Elizabeth. TB HIV Care provides mobile and peer-led health services to sex workers, which includes HIV testing and counselling, tuberculosis (TB) screening, sexually transmitted infection (STI) screening and treatment, and treatment referrals. Participation in the study was restricted to current FSWs who reside in the municipality and who were 18 years or older. The sample size was set to allow for the estimation of HIV prevalence within a +/-5% margin of error, assuming that the prevalence ranged between 40 and 70%.

The protocol was approved by the HSRC review board (REC 3/18/06/14) and the JHU School of Public review committee (No. 00005829). Approval for this secondary analysis was received from the University of Cape Town Human Research Ethics Committee (IRB0001938, REC-210208-007).

Study design

The study design consisted of an interviewer-administered questionnaire as well as HIV and STI testing by a study nurse. The study material was available in isiXhosa (a local language) and English. Each participant completed a 30-45 minute questionnaire administered by a trained interviewer. The questionnaire covered demographics, health and mental health, social stressors, risk behaviours, and sexual and reproductive health factors. Participants were then given an HIV test as well as a rapid plasma regain (RPR) test for syphilis. Each participant that completed these steps received an incentive of ZAR50 as well as three coupons to recruit additional participants with an incentive of ZAR25 attached to each participant recruited – as well as an additional ZAR50 for the second visit to the research site. A total remuneration of ZAR175 was thus possible for someone who recruited three participants and who visited the research site twice.

Sampling

RDS is a chain referral sampling strategy where initial seeds (participants) are recruited and given coupons to recruit subsequent study participants. This method allows for population proportion estimation of hard to reach populations where no sampling frame is available, by adjusting the point estimates and confidence intervals

based on factors such as network size as well as the likelihood of a participant recruiting another participant with similar characteristics (homophily). These adjustments allow for the estimation of population proportions. RDS has been successfully used across many studies on FSWs and other key populations in South Africa and abroad [12,18-20].

Depression

The Patient Health Questionnaire-9 (PHQ-9) instrument was used in this study to measure depression. This is an established instrument that is used within clinical settings as a diagnostic tool and is based on the diagnostic criteria for major depressive disorder within the Diagnostic Manual of Mental Disorders (DSM-V) [21]. In an assessment of the criterion validity the instrument compared well to a professional diagnosis (gold standard) – with a reported sensitivity of 88% and a specificity of 88% [21]. The instrument consist of 9 questions with a possible score of 0 to 3 for each of the questions and a total maximum score of 27. Participants were asked “over the last 2 weeks how often do you experience” each of the 9 symptoms detailed in the questions, with an answer of 0 being “not at all”, 1 “several days”, 2 “more than half of the days”, and 3 “nearly every day”. A cut-off of >9 is used for the estimation of the prevalence risk ratio, as this is the level at which psychotherapy and medication is indicated. There were two participants with missing values on some of the items, so the average score of their non-missing questions was imputed to allow for population proportion estimation.

Social factors

Social and healthcare stigma and police harassment were measured via indices. The social stigma index consisted of three items, the police harassment index consisted of six items and the healthcare stigma index consisted of five items. These were transformed into categorical variables as there were very few participants indicating high levels of these. Violence and rape was coded into three categories: experienced in last 12 months, experienced more than 12 months prior, and never experienced. Income was transformed from a numeric variable to a binary variable as the range of the monthly income was narrow. Number of years practicing sex work was transformed into three quintiles. The number of dependents a participant had was dichotomised with “0” indicating one or more dependents, and “1” indicating no dependents.

HIV and bio-behavioural risk factors

The HIV result variable is derived from HIV test results as well as self-reporting of known HIV positive status. The variable was coded into three categories: HIV negative, HIV positive with known status, and HIV positive with unknown status. The syphilis test outcome variable was based on the RPR test result. Having experienced an STI in the last 12 months was self-reported. Participants who reported in the survey that they have initiated antiretroviral therapy (ART) were also asked if they are currently adherent. Condom use, anal sex, and drug and alcohol use behaviour were self-reported. Condom use, which was collected as a 5-point Likert scale, was coded into a collapsed three level scale as very few people in the sample said that they “never use condoms” or that they “almost never use condoms”. Binge drinking was defined

as those who drink six or more standard drinks per occasion at least once a week. An interaction term between self-reported binge drinking and substance use within the last 12 months was created.

Statistical analysis

The study data were imported into STATA 14.2 for analysis. The STATA RDS add-on package was used, as RDS estimation is not part of the standard analytic offerings available in STATA [22]. The RDS package allowed for the weighting and adjustments of estimates based on the likelihood of similar people recruiting each other (homophily) and network size. 95% bootstrapped confidence intervals (BCI) were generated. Data also had to be imputed for all variables with missing values – as full case analysis is a requirement for the RDS estimation calculation. RDS only works with binary or categorical data. No numeric variable was thus estimated through RDS. Numeric data were transformed into binary or categorical variables.

The prevalence ratio (PR) is used as all outcomes are over 10% prevalent, so the odds ratio (OR) would give a biased estimate of the PR. The PR can be computed with either a log-binomial model, Cox regression with constant time at risk or a robust Poisson regression, but there are known issues with model convergence [23]. The log-binomial model was used for this study. There was no issue with convergence found. For each of the variables we provide the mean PHQ-9 score, a bivariate PR (crude) and a multivariate adjusted prevalence ratio (aPR). In the adjusted analysis we controlled for demographic factors that were associated with the depression outcome: number of dependents, income and number of years practising sex work. In our second model we used syphilis as the outcome together with depression and other

social drivers of HIV that were associated with both syphilis and depression. All associations that are statistically significant are highlighted in bold.

Results

Demographics

Table 1 (below) provides an overview of selected demographic and health variables. A total of 410 participants were recruited through nine initial seeds (participants). The median number of referral waves was six with an interquartile range (IQR) of 4-9, which met the requirements of convergence. The median network size of a study participant was ten (IQR 6-15). Homophily was low (<0.2), which indicates that the groups are networked. The mean age was 29.4 (unadjusted IQR 24-33). Most participants only had high school level education (RDS 72.4%, 95% BCI 66.6-78.1). More than 60% of participants have one or more dependents (RDS 64.2%, 95% BCI 55.6-68.9). The mean income for the participants was ZAR3,202 (IQR 1,690-3,780) and the average years of working as a sex worker was six (IQR 2-7 years).

Table 1. Demographics, depression and health outcomes

	Crude (sample statistics)		RDS population estimate	
	n	%	% (BCI) ^a	Homophily
Age				
Median, SD, IQR ^b	Median=28, SD=7.45, IQR (24-33)			
18-24	122/410	29.8	37.7 (3.0-45.5)	0.14
25-34	205/410	50.0	43.9 (37.0-50.7)	0.15
35+	83/410	20.2	18.4 (12.7-24.1)	0.15
Education				
Grade 1-7	50/410	12.2	12.2 (8.0-16.4)	0.04
Grade 8-11	300/410	73.2	72.4 (66.6-78.1)	0.08
Grade 12 and higher	60/410	14.6	15.4 (10.7-20.2)	0.05
Dependents				
None	150/410	36.6	35.8 (28.9-42.7)	0.12
One or more	260/410	63.4	64.2 (57.3-71.1)	0.07
Income monthly				
Median, SD, IQR	Median=2100, SD=3297, IQR (1680-3780)			
Under ZAR2000	151/410	36.8	37.8 (31.1-44.4)	0.13
Over ZAR2000	259/410	63.2	62.2 (55.6-68.9)	0.15
Years in sex work ^c				
Median, SD, IQR	Median=5, SD=8.5, IQR=5 (2-7)			
0-3 years	17/410	43.2	49.1 (41.8-56.4)	0.05
4-6 years	113/410	27.6	24.8 (19.6-30.0)	0.05
7 or more years	120/410	29.3	26.0 (20.0-32.0)	0.08
Syphilis ^d				
No	315/396	79.5 (75.3-83.2)		
Yes	81/396	20.5 (16.8-24.7)		
HIV status ^d				
Unknown HIV+	43/401	10.7 (8.0-14.2)		
Known HIV+	214/401	53.4 (48.4-58.2)		
HIV -	144/401	35.9 (31.3-40.7)		
On ART currently (adherent) ^d				
No	17/119	14.3 (9.0-21.9)		
Yes	102/119	85.7 (78.1-91.0)		
Depressed				
PHQ-9 score (median, SD, range)	Median=5.78, SD=6.29 (0-27)			
Minimal (0-4)	218/410	53.2	55.9 (49.0-62.8)	0.11
Mild (5-9)	69/410	16.8	15.6 (11.0-20.1)	0.08
Moderate (10-14)	74/410	18.0	16.5 (11.3-21.7)	0.06
Moderately Severe (15-19)	38/410	9.3	8.8 (5.3-12.4)	0.05
Severe (20-27)	11/410	2.7	3.3 (0.1-6.6)	-0.03

^a bootstrapped confidence interval = 1000 reps^b standard deviation (SD); interquartile range (IQR)^c 3 missing values imputed for years in sex work using mean^d RDS extrapolation to population was not possible as there were too many missing values

HIV and sexually transmitted infections

RDS population estimation was not performed on the HIV and syphilis results, as there were missing data. A total of 64.1% (n=257) tested HIV positive. Of those who are HIV positive, 83% knew their status to be positive (n=214). Of the 214 known HIV positive participants, 46.8% (n=119) had ever initiated ART, and, of those, 85.7% (n=102) self-reported they were ART adherent. Of the 396 participants who had a valid syphilis test result, 20.5% (n=81) tested positive for syphilis.

Depression

The depression PHQ-9 instrument was found to have a high internal consistency with a *Cronbach alpha* of 0.8735. The mean depression score was 5.8 and the median was 4. Over 50% of the participants did not have any symptoms of depression (RDS 55.9%, 95% BCI 49-62.8). A total of 30% of participants and 28.6% of the population of FSWs in Nelson Mandela Bay are estimated to have clinically significant depression based on a PHQ-9 cut-off of >9.

Economic factors and social circumstances

Table 2 (below) provides an overview of the association between depression and social drivers of HIV. Participants who were homeless were over three times as likely to be depressed (aPR 3.2, 95% CI 2.66-4.10, $p<0.0001$). Those who were living with family members were less likely to be depressed (aPR 0.65, 95% CI 0.48-0.87, $p=0.004$), while those who lived alone were more likely to be depressed (aPR 1.63, 95% CI 1.12-2.37, $p=0.011$). Participants without dependents were less likely to be

depressed (aPR 0.67, 95% CI 0.4-0.94, p=0.023). Most participants (70.2%, n=290) indicated they work as sex workers in order to feed their families. These participants were almost two and a half times more likely to be classified as being depressed (aPR 2.44, 95% CI 1.48-4.03, p<0.0001) compared to those who had other reasons for practising sex work. Participants who earned more than ZAR2,000 per month had a 50% higher likelihood of being depressed compared to those who earn less (aPR 1.48, 95% CI 1.95-2.07, p=0.23).

Table 2. Association between depression and social drivers of HIV

	N (%)	No to mild depression n (%)	Moderate to severe depression n (%)	PR (95% CI)	aPR (95% CI)
Homeless					
No	398/410 (97.0)	283/398 (71.1)	115/398 (28.9)	2.31 (1.51-3.55)	3.30 (2.65-4.09)
Yes	12/410 (3.0)	4/12 (33.3)	8/12 (66.7)		
Living with family					
No	112/410 (27.4)	67/112 (59.8)	45/112 (40.2)	0.65 (0.49-0.88)	0.65 (0.48-0.87)
Yes	298/410 (72.6)	220/298 (73.8)	78/298 (26.2)		
Living alone					
No	376/410 (91.8)	269/376 (71.5)	107/376 (28.5)	1.65 (1.12-2.45)	1.63 (1.12-2.37)
Yes	34/410 (8.2)	18/34 (52.9)	16/34 (47.1)		
Dependents					
One or more	260/410 (63.5)	171/260 (65.8)	89/260 (34.2)	0.66 (0.48-0.94)	0.67 (0.48-0.94)
None	150/410 (36.5)	116/150 (77.3)	34/150 (22.7)		
SW to feed family					
No	120/410 (29.3)	102/120 (85.0)	18/120 (15.0)	2.41 (1.54-3.80)	2.44 (1.48-4.03)
Yes	290/410 (70.7)	185/290 (63.8)	105/290 (36.2)		
Income monthly					
Under ZAR2000	151/410 (36.8)	117/151 (77.5)	34/151 (22.5)	1.53 (1.09-2.15)	1.48 (1.95-2.07)
Over ZAR2000	259/410 (63.2)	170/259 (65.6)	89/259 (34.4)		
Healthcare stigma					
No	340/410 (83.0)	251/340 (73.8)	89/340 (26.2)	1.86 (1.38-2.51)	1.64 (1.21-2.24)
Yes	70/410 (17.0)	36/70 (51.4)	34/70 (48.6)		
Tell healthcare provider SW					
No	298/409 (72.8)	199/298 (66.7)	99/298 (33.3)	0.65 (0.45-0.97)	0.69 (0.47-1.01)
Yes	111/409 (27.2)	87/111 (78.4)	24/111 (21.6)		
Perceived police harassment					
Low	204/410 (49.8)	213/285 (74.8)	72/285 (25.2)	Referent	Referent
Medium	158/410 (38.5)	47/77 (61.1)	30/77 (38.9)	0.97 (0.70-1.36)	1.05 (0.76-1.47)
High	48/410 (11.7)	27/48 (56.3)	21/48 (43.7)	1.53 (1.05-2.27)	1.54 (1.04-2.28)

	N (%)	No to mild depression n (%)	Moderate to severe depression n (%)	PR (95% CI)	aPR (95% CI)
Perceived social stigma					
Low	269/410 (65.6)	200/269 (74.3)	69/269 (25.6)	Referent	Referent
Medium	99/410 (24.2)	61/99 (61.6)	38/99 (38.3)	1.49 (1.08-2.06)	1.54 (1.10-2.14)
High	42/410 (10.2)	26/42 (61.9)	16/42 (38.0)	1.48 (0.96-2.29)	1.47 (0.93-2.30)
Safe space in community				0.66 (0.50-0.89)	0.67 (0.50-0.89)
No	119/410 (29.0)	72/119 (60.5)	47/119 (39.5)		
Yes	291/410 (71.0)	215/291 (73.8)	76/291 (26.2)		
Raped/sexual assault					
No exposure	253/410 (61.7)	187/253 (74.0)	66/253 (26.0)	0.72 (0.53-0.96)	0.70 (0.52-0.95)
> 12 months ago	71/410 (17.3)	50/71 (70.0)	21/71 (30.0)	0.98 (0.66-1.45)	0.95 (0.64-1.43)
Within 12 months	86/410 (20.9)	50/86 (58.0)	36/86 (42.0)	1.56 (1.15-2.12)	1.58 (1.17-2.14)
Raped as a child <18				2.02 (1.47-2.79)	1.92 (1.39-2.65)
No	368/410 (89.8)	268/368 (72.8)	100/368 (27.2)		
Yes	42/410 (10.2)	19/42 (45.2)	23/42 (54.8)		
Violence					
No exposure	157/410 (38.3)	117/157 (74.5)	40/157 (25.5)	0.77 (0.56-1.06)	0.82 (0.60-1.13)
> 12 months ago	94/410 (29.9)	70/94 (74.5)	24/94 (25.5)	0.81 (0.55-1.19)	0.78 (0.54-1.14)
Within 12 months	159/410 (38.8)	100/159 (63.0)	49/159 (37.0)	1.45 (1.08-1.95)	1.40 (1.05-1.87)

Stigma, safety and harassment

The *Cronbach alpha* for the social stigma index was 0.7847, the police harassment index was 0.6814 and the perceived healthcare stigma index was 0.6935. Those who indicated perceived healthcare stigma were more likely to have depression (aPR 1.64, 95% CI 1.21-2.24, $p=0.002$), while those who were depressed were also less likely to have disclosed their occupational status to a healthcare provider (aPR 0.69, 95% CI 0.47-1.01, $p=0.059$). Participants reporting perceived police harassment were more likely to be depressed (aPR 1.54, 95% CI 1.04-2.28, $p=0.031$). Those who experience the most social stigma were more likely to be depressed than those who indicated low levels of stigma (aPR 1.47, 95% CI 0.93-2.30, $p=0.093$) – but this was only significant at the $p<0.10$ level. Having safe spaces in the community was a strong protective factor (aPR 0.67, 95% CI 0.50-0.87, $p=0.001$).

Violence and rape

Participants who had never had a rape exposure (n=253) were 30% less likely to be depressed (aPR 0.70 95% CI 0.52-0.95, p=0.02) compared to those who have experienced such within the last 12 months (n=86) or more than 12 months prior (n=71). Those who have experienced rape within the last 12 months had the highest level of depression and were 58% more likely to be depressed (aPR 1.58, 95% CI 1.17-2.14, p=0.003). While there was no significant relationship between depression and having experienced rape more than 12 months ago, there was strong relationship between depression and having a rape exposure as a child younger than 18 years old. About 10% (n=42) had been sexually assaulted or raped as children. These participants were twice as likely to be depressed compared to those who had not experienced such trauma as a child (aPR 1.92, 95% CI 1.39-2.65, p<0.0001). Participants indicating exposure to violence within the last 12 months (n=159) were 40% more likely to be depressed compared to those who had no exposure to violence (n=157) or those who had an exposure more than 12 months prior (n=94, aPR 1.40, 95% CI 1.05-1.87, p=0.02).

HIV and bio-behavioural risk factors

Table 3 provides an overview of the association between depression, HIV and bio-behavioural risk factors. There was no statistically significant association between condom use and depression. Depression was also not related to anal sex or unprotected intercourse for money. HIV status also had no relationship with the prevalence of depression. Syphilis as well as self-reported STIs within the last 12 months were associated with depression. When controlling for the number of years in

sex work, income and dependents, it was found that those who were depressed were 50% more likely to also have syphilis (aPR 1.51, 95% CI 1.08-2.12, p=0.016). Participants who are currently on ART were less likely to be depressed compared to their non-adherent counterparts (aPR 0.50, 95% CI 0.27-0.92, p=0.027). Participants who have reported drug use within the last 12 months were also 44% more likely to be depressed (aPR 1.44, 95% CI 1.05-1.98, p=0.021). There was no association between depression and binge drinking, but those who reported both drug use and binge drinking were almost twice as likely to be depressed compared to those who indicated neither or only one (aPR 1.90, 95% CI 1.17-3.11, p=0.01).

Table 3. Association between depression and bio-behavioural risk factors

	N (%)	No to mild depression n (%)	Moderate to severe depression n (%)	PR (95% CI)	aPR (95% CI)
Condom use					
Almost never	18/406 (4.4)	14/18 (77.8)	4/18 (22.2)	0.74 (0.31-1.78)	0.70 (0.29-1.67)
Sometimes	163/406 (40.1)	117/163 (71.8)	46/163 (28.2)	0.93 (0.82-1.53)	0.92 (0.68-1.25)
Almost always	225/406 (55.4)	155/225 (68.9)	70/225 (31.1)	1.13 (0.68-1.26)	1.43 (0.84-1.55)
Unprotected intercourse for money					
No	301/410 (73.4)	207/301 (68.8)	94/301 (31.2)	0.85 (0.59-1.21)	0.88 (0.61-2.125)
Yes	109/410 (26.6)	80/109 (73.4)	29/109 (26.6)		
Anal sex (12 months)					
No	374/408 (91.7)	266/374 (71.1)	108/374 (28.9)	1.32 (0.84-2.09)	1.26 (0.79-2.01)
Yes	34/408 (8.3)	21/34 (61.8)	13/34 (38.2)		
Syphilis					
No	315/396 (79.5)	229/315 (72.7)	86/315 (27.3)	1.31 (0.93-1.85)	1.51 (1.08-2.12)
Yes	81/396 (20.5)	52/81 (64.2)	29/81 (35.8)		
HIV status					
HIV+ (unknown)	43/401 (10.7)	30/43 (69.8)	13/43 (30.2)	1.01 (0.62-1.64)	0.94 (0.58-1.52)
HIV+ (known)	214/401 (53.4)	154/214 (72.0)	60/214 (28.0)	0.87 (0.65-1.18)	0.88 (0.65-1.19)
HIV -	144/401 (35.9)	97/144 (67.4)	47/144 (32.6)	1.15 (0.85-1.56)	1.17 (0.87-1.59)
STI screening in last 12 months					
No	300/410 (73.2)	203/300 (67.7)	97/300 (32.3)	0.73 (0.50-1.06)	0.79 (0.54-1.14)
Yes	110/410 (26.8)	84/110 (76.4)	26/110 (23.6)		
STI in last 12 months					
No	255/410 (62.2)	193/255 (75.7)	62/255 (24.3)	1.62 (1.20-2.16)	1.53 (1.14-2.04)
Yes	155/410 (37.8)	94/155 (60.6)	61/155 (39.4)		
On ART currently (adherent)					
No	17/119 (14.3)	10/17 (58.8)	7/17 (41.2)	0.62 (0.32-1.19)	0.50 (0.27-0.92)
Yes	102/119 (85.7)	76/102 (74.5)	26/102 (25.5)		

	N (%)	No to mild depression n (%)	Moderate to severe depression n (%)	PR (95% CI)	aPR (95% CI)
Drug use in last 12 months				1.37 (1.00-1.88)	1.44 (1.05-1.98)
No	315/410 (76.8)	228/315 (72.4)	87/315 (27.6)		
Yes	95/410 (23.2)	59/95 (62.1)	36/95 (37.9)		
Binge drinking (current)				0.94 (0.62-1.44)	0.83 (0.54-1.28)
No	347/410 (84.6)	242/347 (69.7)	105/347 (30.3)		
Yes	63/410 (15.4)	45/63 (71.4)	18/63 (28.6)		
Drug and binge drinking (interaction)				1.97 (1.22-3.18)	1.90 (1.17-3.11)
No	396/410 (96.6)	281/396 (71.0)	115/396 (29.0)		
Yes	14/410 (3.4)	6/14 (42.9)	8/14 (57.1)		

Syphilis and depression adjusted for other social covariates

All social factors that were associated with depression at $p < 0.05$ level of significance in the adjusted analysis (**table 2**) were included in a multivariate analysis using syphilis as the outcome and depression as a covariate (**table 4**). In the crude analysis, having no dependents was associated with a higher likelihood of syphilis (PR 1.61, 95% CI 1.09-2.36, $p = 0.016$), while earning more money (PR 0.57, 95% CI 0.39-0.84, $p = 0.004$), and working as a sex worker to feed ones family (PR 0.67, 95% CI 0.45-0.99, $p = 0.044$), and having safe spaces in the community (PR 0.65, 95% CI 0.44-9.6, $p = 0.032$) were associated with a lower likelihood of syphilis. In the adjusted model there was an increase in the prevalence ratio between depression and syphilis when controlling for the social covariates (aPR 1.64, 95% CI 1.08-2.49, $p = 0.02$). There was, however, a decrease in the aPR for some of these whereby having no dependents and working as a sex worker to feed family was no longer significantly associated with syphilis.

Table 4. Association between social factors, depression and syphilis

	Reactive RPR test for syphilis (crude)	Reactive RPR test for syphilis (adjusted)
Depression	1.31 (0.93-1.85)	1.64 (1.08-2.49)
No dependents	1.61 (1.09-2.36)	1.52 (0.96-2.39)
Income monthly >ZAR2000	0.56 (0.39-0.84)	0.58 (0.40-0.86)
SW to feed family	0.67 (0.45-0.99)	0.72 (0.45-1.18)
Safe space available in community	0.65 (0.44-0.96)	0.63 (0.43-0.92)

Discussion

While the prevalence of depression among FSWs (28.6%) in our study was three times higher compared to HIV positive females attending an ART clinic in South Africa (10.2%) [25], our results were notably lower than the two other South African studies focussing on FSWs. It was approximately 40% lower than the study in Gauteng, and 20% lower than the study in KwaZulu-Natal [12,13]. The same measurement instrument (PHQ-9) was used for our study and the one based in KwaZulu-Natal. Not enough is known of the setting of the KwaZulu-Natal study to consider possible contextual differences which may explain some of the variance. The instrument used in the Gauteng study was different to the one used in our study. This may potentially explain some of the variance, but likely not all of it. Our study also reported positive associations between depression and bio-behavioural risk factors, while the other two South African studies did not report any such association.

While having a higher income was associated with a higher likelihood of being depressed, it was also associated with a lower likelihood of testing positive for syphilis. Participants who have dependents were more likely to be depressed; however, they were less likely to have syphilis. Participants who live with their families were less likely to be depressed than those who lived alone. It seems that the family and economic

situation is crucial in understanding the risk of HIV, STIs and depression, but this is also more complex than simple linear causation.

Exposure to violence and rape are strong predictors of depression which correspond with other studies among female sex workers in South Africa [12], the United States of America [24] and Croatia [25]. We also found a recency effect where more recent exposures are linked to a higher likelihood of depression. There was also evidence of a latency effect where experience/s of rape as a child were more strongly associated with depression than a recent experience of rape. This signals that purely risk reduction and brief behavioural interventions might not be suitable in dealing with much of the aftermath of sexual and physical violence on risk behaviour and depression.

Surprisingly, there was no significant difference in self-reported condom use between those who are depressed and those who were not depressed. While the prevalence of HIV and STIs was high in the sample, the number of participants acknowledging inconsistent condom use was low. This might signal some potential measurement error and bias where the degree of consistent condom use is systematically overstated. More robust methods of measuring condom use would be necessary to assess the effect of mental health on HIV risk. HIV status was also not related to depression.

A promising finding is that those who were adherent to treatment were also less likely to be depressed. This is intuitive but there are several studies looking into adherence and depression among the general population which reported no such link [26-28]. There is also evidence that adherence to oral PrEP is associated with baseline depression levels in two longitudinal studies [29,30]. This is important as a recent systematic review and modelling studies have found that PrEP and immediate ART

initiation can significantly reduce HIV incidence among sex workers in South Africa when coupled to our existing condom distribution programmes [4]. The link between mental health and adherence to PrEP and ART should continue to remain an avenue of enquiry – especially in the face of contradictory evidence.

As this study was cross-sectional in design, we cannot determine causality. There is very little experimental data on the effectiveness of mental health interventions in reducing HIV risk for FSWs. This study did not provide an in-depth look at the causal mechanism through which depression may act as a mediator between bio-behavioural and social risk factors and HIV outcomes.

RDS is one of the few available methods to extrapolate population estimates for key population studies with hidden populations. There is, however, valid criticism on whether the complex mathematical operations upon which it is based, really do lead to an unbiased population proportion estimate. This critique may be valid to a certain degree – but with few alternatives available, RDS is better suited than simpler non-probability sampling methods. There is also some critique around the confidence intervals generated via the bootstrapped method for RDS estimates, which are deemed to be too narrow by some who argue that they do not reflect the extent of the uncertainty of the estimations [22].

This study is based on data that are several years old, so any extrapolation to the Nelson Mandela Bay Municipality sex worker population presently should be done with caution. Lastly, depression as measured in this study and other studies is variable across settings – even within a country. Thus generalizing our findings to other sex worker groups without an appreciation of the variability in the available literature is not suggested.

Conclusion

This study demonstrates that depression among sex workers is not only important in relation to HIV but also is a substantive issue that needs attention in its own right. In order to provide effective HIV prevention and treatment services to sex workers, we need to consider mental health as being an important component of such a package. However, just integrating mental health components into existing interventions might also not be effective in dealing with depression if such interventions do not deal with the real social and economic stressors that may cause and maintain risk behaviour and depressive symptoms. Further high quality research on different mental health interventions in different contexts is necessary, before any conclusion may be reached. Furthermore we found the existing risk delimitation to be too simplistic as it does not provide adequate links to intrapersonal factors such as mental health. We suggest that intrapersonal factors be considered in both public health programmes and research among sex workers and other key populations.

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PART D: APPENDICES

Appendix 1: PLoS One guidelines

<https://journals.plos.org/plosone/s/submission-guidelines#loc-style-and-format>



MANUSCRIPT BODY FORMATTING GUIDELINES

Modified April 2017

1 Abstract

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3 Vestibulum adipiscing urna ut lectus gravida, vitae blandit tortor
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22 Materials and methods

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27 sodales vulputate auctor. Nam sit amet nulla lacus a, Figs 1 and 2
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29 pellentesque vitae.

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31 Fig 1. This is the Fig 1 Title. This is the Fig 1 legend.

32 Fig 2. This is the Fig 2 Title. This is the Fig 2 legend.

33

File Naming for Figures

- Figure files should be saved as "Fig1.tif", "Fig2.eps", etc.
- Acceptable file formats for figures are ".tif", ".tiff", and ".eps"
- Figures should be uploaded separately as individual files.
- PLOS ONE guidelines for figures can be found here: <http://journals.plos.org/plosone/s/figures>

1

Level 1 Heading

- Use Level 1 heading for all major sections (Abstract, Introduction, Materials and methods, Results, Discussion, etc.).
- Bold type, 18pt font.
- Only use italics and text formatting where needed (e.g. genus and species names, genes, etc.).
- Headings should be written in sentence case (capitalize only the first word of the heading, the first word of the subheading, and any proper nouns and genus names).

NOTE: Do not cite figures, tables, supporting information, or references in the Abstract.

Figure Citations

- Cite figures as "Fig 1", "Fig 2", etc.
- Cite figures and tables in order.
- Do not cite "Fig 2" before "Fig 1".
- Cite multiple figures as "Figs 1 and 2", "Figs 1-3", etc.

Figure Captions

- Each figure caption should appear directly after the paragraph in which they are first cited.
- Do not include tables within captions.
- Use bold type for the figure titles.

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37 Lorem ipsum dolor sit amet, consectetur adipiscing elit.
38 Vestibulum adipiscing urna ut lectus gravida, vitae blandit tortor
39 interdum. Donec p^2 et q^2 tincidunt porta sem nec hendrerit.

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$$p^2 + 2pq + q^2 = 1 \quad (1)$$

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47 Genotyping

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56 Whole genome RFLP analysis

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61 sodales vulputate auctor. Numquam iens dare tibi up.

62

NOTE: This document is presented in single-space paragraph format for ease of use. Please submit your manuscript in double-space paragraph format.

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Display/Numbered Equation

- Format display equations in Mathtype or Equation Tools.
- Do not use Graphic Objects.

Inline Equation

- Format in regular text or as an inline equation in Mathtype or Equation Tools.
- Do not use Symbol Font.
- Do not use Graphic Objects.

Level 2 Heading

- Use Level 2 headings for sub-sections of major sections.
- Bold type, 16pt font.
- Only use italics and text formatting where needed.
- Use sentence case.

Level 3 heading

- Use Level 3 headings for sub-sections within Level 2 headings.
- Bold type, 14pt font.
- Only use italics and text formatting where needed.
- Use sentence case.

65 Results and discussion

66 Lorem ipsum dolor sit amet, consectetur adipiscing elit.
67 Vestibulum adipiscing urna ut lectus gravida, et bland **Table 1**
68 Donec tincidunt porta sem nec hendrerit. Vestibulum nec pharetra
69 quam, vitae convalli. Fido nemo.

70 **Table 1. This is the Table 1 Title.**

	Chemical W	Chemical X	Chemical Y	Chemical Z
Chemical 1	Reaction 1W	Reaction 1X	Reaction 1Y	Reaction 1Z
Chemical 2	Reaction 2W	Reaction 2X	Reaction 2Y	Reaction 2Z
Chemical 3	Reaction 3W ^a	Reaction 3X	Reaction 3Y ^b	Reaction 3Z
Chemical 4	Reaction 4W	Reaction 4X	Reaction 4Y	Reaction 4Z
Chemical 5	Reaction 5W	Reaction 5X	Reaction 5Y	Reaction 5Z

71 This is the Table 1 legend.

72 ^aTable footnotes belong here.

73 ^bFootnotes should have corresponding symbols in the table.

74

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76 Conclusions

77 Lorem ipsum dolor sit amet, consectetur adipiscing **[1-5]**.
78 Vestibulum adipiscing urna ut lectus gravida, vitae blandit tortor
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80 pharetra quam, vitae convallis nunc. Mauris in mattis sapien. Fusce
81 sodales vulputate auctor **S1 Fig**. Dolor sit amet **S1 and S2 Tables**.

82

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3

Tables and Table Citations

- Tables should be cited as "Table 1", "Table 2", etc.
- Cite multiple tables as "Tables 1 and 2", "Tables 1-3", etc.
- Tables should be included directly after the paragraph in which they are first cited.
- Tables must be cell-based in Microsoft Word or embedded with Microsoft Excel.
- Do not use empty rows to create spacing.
- Do not include graphic objects, images, or colored text.
- See PLOS ONE Table Guidelines for more complete instructions: <http://journals.plos.org/plosone/s/tables>

Reference Citations

- Cite references in brackets (for example, "[1]" or "[2-5]" or "[3,7,9]").
- References must be cited in order at first mention.

Supporting Information Citations

- Format Supporting Information Citations as "S1 Fig", "S1 Table", etc.
- Cite multiple files as "S1 and S2 Figs", "S1-S3 Figs", etc.
- It is not required to cite each Supporting Information file.
- Supporting information should be uploaded separately as individual files.

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85 Acknowledgments

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87 Vestibulum adipiscing urna ut lectus gravida, vitae blandit tortor
88 interdum.

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91 References

- 92 1. Doe J, Data A, van Stats J, Testperson M, Ribosome D Jr,
93 McBio GHT, et al. This is the article title. PLoS ONE.
94 2017;12(12):e000000. doi: 10.1371/journal.pone.0000000
- 95 2. Doe J, Data A, van Stats J, Testperson M, Ribosome D Jr,
96 McBio GHT, et al. Bunny dynamics in cartoon landscapes.
97 PLoS ONE. Forthcoming 2017.

98

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100 Supporting information

101 **S1 Fig. This is the S1 Fig Title.** This is the S1 Fig legend.

102 **S2 Fig. This is the S2 Fig Title.** This is the S2 Fig legend.

103 **S1 Table. This is the S1 Table Title.** This is the S1 Table legend.

104 **S2 Table. This is the S2 Table Title.** This is the S2 Table legend.

105 **S1 File. This is the S1 File Title.** This is the S1 File legend.

File Naming for Supporting Information

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- All file types are supported.
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Acknowledgments

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References

- References should be listed after the main text, before the supporting information.
- References with more than six authors should list the first six author names, followed by "et al."
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- Use a Level 1 heading.
- Use bold type for the titles.
- Supporting Information files do not require full captions; only labels ("S1 Fig") are fully required.

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For assistance preparing figures, please contact figures@plos.org

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This is the article title

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7 John Doe^{1‡}, Antonie Data^{1‡}, Johannes van Stats^{1,4a}, Marie Testperson^{2*}, David

8 Ribosome Jr.^{3,5}, Gregory H.T. McBio^{4,6}, Angela Reviewerson^{1,3&}, Marina

9 Measure^{1&}, on behalf of The Bunny Genome Sequencing Consortium[^]

10

11

12

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17 Lagomorph, Connecticut, United States of America

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32 [‡]These authors contributed equally to this work.

33 [&]These authors also contributed equally to this work.

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35

36 [^]Membership of the Bunny Genome Sequencing Consortium is provided in the

37 Acknowledgments.

38

Symbol Legend		
Symbol	Name	Definition
¶	Pilcrow (paragraph symbol)	1st set of equal contributors
&	Ampersand	2nd set of equal contributors
*	Asterisk	Corresponding author(s)
#a	Pound/number sign	First Current address
#b	Pound/number sign	Second Current address
†	Dagger/Cross	Deceased
^	Caret	Consortium/Group Authorship

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- Please use the symbols provided in this document for other designations.
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- Use the symbols provided here to indicate equal contributions.
- If you would like the equal contributions notes to read differently, please specify in your manuscript (e.g., "AR and MM are Joint Senior Authors").

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- If there is a consortium or group author on your manuscript, please provide a note that describes where the full membership list is available for the readers.
- The membership list can be listed in the Acknowledgments, in Supporting Information, or on the internet.
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Modified January 2017

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Related information for authors

- > [Submission system](#)
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- > [Getting started guide](#)
- > [Guidelines for revisions](#)
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File format	Manuscript files can be in the following formats: DOC, DOCX, or RTF. Microsoft Word documents should not be locked or protected. LaTeX manuscripts must be submitted as PDFs. Read the LaTeX guidelines.
Length	Manuscripts can be any length. There are no restrictions on word count, number of figures, or amount of supporting information. We encourage you to present and discuss your findings concisely.
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Reference style	PLOS uses "Vancouver" style, as outlined in the ICMJE sample references. See reference formatting examples and additional instructions below.

Equations	We recommend using MathType for display and inline equations, as it will provide the most reliable outcome. If this is not possible, Equation Editor or Microsoft's Insert→Equation function is acceptable. Avoid using MathType, Equation Editor, or the Insert→Equation function to insert single variables (e.g., "$a^2 + b^2 = c^2$"), Greek or other symbols (e.g., β, Δ, or '[prime]'), or mathematical operators (e.g., $\times$, $\geq$, or $\pm$) in running text. Wherever possible, insert single symbols as normal text with the correct Unicode (hex) values. Do not use MathType, Equation Editor, or the Insert→Equation function for only a portion of an equation. Rather, ensure that the entire equation is included. Equations should not contain a mix of different equation tools. Avoid "hybrid" inline or display equations, in which part is text and part is MathType, or part is MathType and part is Equation Editor.
Nomenclature	Use correct and established nomenclature wherever possible. <i>Units of measurement</i> Use SI units. If you do not use these exclusively, provide the SI value in parentheses after each value. Read more about SI units. <i>Drugs</i> Provide the Recommended International Non-Proprietary Name (rINN). <i>Species names</i> Write in italics (e.g., <i>Homo sapiens</i>). Write out in full the genus and species, both in the title of the manuscript and at the first mention of an organism in a paper. After first mention, the first letter of the genus name followed by the full species name may be used (e.g., <i>H. sapiens</i>). <i>Genes, mutations, genotypes, and alleles</i> Write in italics. Use the recommended name by consulting the appropriate genetic nomenclature database (e.g., HGNC for human genes; we strongly recommend using this tool to check against previously approved names). It is sometimes advisable to indicate the synonyms for the gene the first time it appears in the text. Gene prefixes such as those used for oncogenes or cellular localization should be shown in roman typeface (e.g., v-fes, c-MYC). <i>Allergens</i> The systematic allergen nomenclature of the World Health Organization/International Union of Immunological Societies (WHO/IUIS) Allergen Nomenclature Sub-committee should be used for manuscripts that include the description or use of allergenic proteins. For manuscripts describing new allergens, the systematic name of the allergen should be approved by the WHO/IUIS Allergen Nomenclature Sub-Committee prior to manuscript publication. Examples of the systematic allergen nomenclature can be found at the WHO/IUIS Allergen Nomenclature site.

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Prior to submission, authors who believe their manuscripts would benefit from professional editing are encouraged to use language-editing and copyediting services. Obtaining this service is the responsibility of the author, and should be done before initial submission. These services can be found on the web using search terms like "scientific editing service" or "manuscript editing service."

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Submissions that do not meet the [PLOS ONE publication criterion for language standards](#) may be rejected.

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Manuscripts should be organized as follows. Instructions for each element appear below the list.

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Middle section	<i>The following elements can be renamed as needed and presented in any order:</i> ➤ Materials and Methods ➤ Results ➤ Discussion ➤ Conclusions (optional)

Ending section	The following elements are required, in order: > Acknowledgments > References > Supporting information captions (if applicable)
Other elements	> Figure captions are inserted immediately after the first paragraph in which the figure is cited. Figure files are uploaded separately. > Tables are inserted immediately after the first paragraph in which they are cited. > Supporting information files are uploaded separately.

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The compiled submission PDF includes low-resolution preview images of the figures after the reference list. The function of these previews is to allow you to download the entire submission as quickly as possible. Click the link at the top of each preview page to download a high-resolution version of each figure. Links to download Supporting Information files are also available after the reference list.

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Include a full title and a short title for the manuscript.

Title	Length	Guidelines	Examples
Full title	250 characters	Specific, descriptive, concise, and comprehensible to readers outside the field	Impact of cigarette smoke exposure on innate immunity: A <i>Caenorhabditis elegans</i> model Solar drinking water disinfection (SODIS) to reduce childhood diarrhoea in rural Bolivia: A cluster-randomized, controlled trial
Short title	100 characters	State the topic of the study	Cigarette smoke exposure and innate immunity SODIS and childhood diarrhoea

Titles should be written in sentence case (only the first word of the text, proper nouns, and genus names are capitalized). Avoid specialist abbreviations if possible. For clinical trials, systematic reviews, or meta-analyses, the subtitle should include the study design.

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All authors must meet the criteria for authorship as outlined in the [authorship policy](#). Those who contributed to the work but do not meet the criteria for authorship can be mentioned in the Acknowledgments. [Read more about Acknowledgments](#).

The corresponding author must provide an ORCID ID at the time of submission by entering it in the user profile in the submission system. [Read more about ORCID](#).

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Enter author names on the title page of the manuscript and in the online submission system.

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- Describe any prior interactions with PLOS regarding the submitted manuscript
- Suggest appropriate Academic Editors to handle your manuscript ([see the full list of Academic Editors](#)).
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 **IMPORTANT:** Do not include requests to reduce or waive publication fees in the cover letter. This information will be entered separately in the online submission system.

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The Abstract comes after the title page in the manuscript file. The abstract text is also entered in a separate field in the submission system.

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- Explain how the study was done, including any model organisms used, without methodological detail
- Summarize the most important results and their significance
- Not exceed 300 words

Abstracts should not include:

- Citations
- Abbreviations, if possible

Introduction

The introduction should:

- Provide background that puts the manuscript into context and allows readers outside the field to understand the purpose and significance of the study
- Define the problem addressed and why it is important
- Include a brief review of the key literature
- Note any relevant controversies or disagreements in the field
- Conclude with a brief statement of the overall aim of the work and a comment about whether that aim was achieved

Materials and Methods

The Materials and Methods section should provide enough detail to allow suitably skilled investigators to fully replicate your study. Specific information and/or protocols for new methods should be included in detail. If materials, methods, and protocols are well established, authors may cite articles where those protocols are described in detail, but the submission should include sufficient information to be understood independent of these references.

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Methods sections describing research using human or animal subjects and/or tissue or field sampling must include required ethics statements. For details, consult the [reporting guidelines for specific study types](#).

Data

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Do not cite the following sources in the reference list:

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- Personal communications (these should be supported by a letter from the relevant authors but not included in the reference list)

References are listed at the end of the manuscript and numbered in the order that they appear in the text. In the text, cite the reference number in square brackets (e.g., "We used the techniques developed by our colleagues [19] to analyze the data"). PLOS uses the numbered citation (citation-sequence) method and first six authors, et al.

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Make sure the parts of the manuscript are in the correct order *before* ordering the citations.

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- !** Because all references will be linked electronically as much as possible to the papers they cite, proper formatting of the references is crucial.

PLOS uses the reference style outlined by the International Committee of Medical Journal Editors (ICMJE), also referred to as the "Vancouver" style. Example formats are listed below. Additional examples are in the [ICMJE sample references](#).

A reference management tool, EndNote, offers a current [style file](#) that can assist you with the formatting of your references. If you have problems with any reference management program, please contact the source company's technical support.

Journal name abbreviations should be those found in the [National Center for Biotechnology Information \(NCBI\) databases](#).

Source	Format
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Online articles	Huynen MMTE, Martens P, Hilderink HBM. The health impacts of globalisation: a conceptual framework. <i>Global Health</i> . 2005;1: 14. Available from: http://www.globalizationandhealth.com/content/1/1/14
Books	Bates B. <i>Bargaining for life: A social history of tuberculosis</i> . 1st ed. Philadelphia: University of Pennsylvania Press; 1992.
Book chapters	Hansen B. New York City epidemics and history for the public. In: Harden VA, Risse GB, editors. <i>AIDS and the historian</i> . Bethesda: National Institutes of Health; 1991. pp. 21-28.
Deposited articles (preprints, e-prints, or arXiv)	Krick T, Shub DA, Verstraete N, Ferreira DU, Alonso LG, Shub M, et al. Amino acid metabolism conflicts with protein diversity. arXiv:1403.3301v1 [Preprint]. 2014 [cited 17 March 2014]. Available from: https://128.84.21.199/abs/1403.3301v1 Kording KP, Mensh B. Ten simple rules for structuring papers. <i>BioRxiv</i> [Preprint]. 2016 bioRxiv 088278 [posted 2016 Nov 28; revised 2016 Dec 14; revised 2016 Dec 15; cited 2017 Feb 9]: [12 p.]. Available from: https://www.biorxiv.org/content/10.1101/088278v5 doi: 10.1101/088278

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Published media (print or online newspapers and magazine articles)	Fountain H. For Already Vulnerable Penguins, Study Finds Climate Change Is Another Danger. The New York Times. 2014 Jan 29 [Cited 17 March 2014]. Available from: http://www.nytimes.com/2014/01/30/science/earth/climate-change-taking-toll-on-penguins-study-finds.html
New media (blogs, web sites, or other written works)	Allen L. Announcing PLOS Blogs. 2010 Sep 1 [cited 17 March 2014]. In: PLOS Blogs [Internet]. San Francisco: PLOS 2006 - . [about 2 screens]. Available from: http://blogs.plos.org/plos/2010/09/announcing-plos-blogs/ .
Masters' theses or doctoral dissertations	Wells A. Exploring the development of the independent, electronic, scholarly journal. M.Sc. Thesis, The University of Sheffield. 1999. Available from: http://bumincad.scix.net/cgi-bin/works/Show72e09
Databases and repositories (Figshare, arXiv)	Roberts SB. QPX Genome Browser Feature Tracks; 2013 [cited 2013 Oct 5]. Database: figshare [Internet]. Available from: http://figshare.com/articles/QPX_Genome_Browser_Feature_Tracks/701214
Multimedia (videos, movies, or TV shows)	Hitchcock A, producer and director. Rear Window [Film]; 1954. Los Angeles: MGM.

Supporting Information

Authors can submit essential supporting files and multimedia files along with their manuscripts. All supporting information will be subject to peer review. All file types can be submitted, but files must be smaller than 20 MB in size.

Authors may use almost any description as the item name for a supporting information file as long as it contains an "S" and number. For example, "S1 Appendix" and "S2 Appendix," "S1 Table" and "S2 Table," and so forth.

Supporting information files are published exactly as provided, and are not copyedited.

Supporting information captions

List supporting information captions at the end of the manuscript file. Do not submit captions in a separate file.

The file number and name are required in a caption, and we highly recommend including a one-line title as well. You may also include a legend in your caption, but it is not required.

Example caption

S1 Text. Title is strongly recommended. Legend is optional.

In-text citations

We recommend that you cite supporting information in the manuscript text, but this is not a requirement. If you cite supporting information in the text, citations do not need to be in numerical order.

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Figures

Do not include figures in the main manuscript file. Each figure must be prepared and submitted as an individual file.

Cite figures in ascending numeric order at first appearance in the manuscript file.

 Read the [guidelines for figures and requirements for reporting blot and gel results](#).

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Figure captions must be inserted in the text of the manuscript, immediately following the paragraph in which the figure is first cited (read order). Do not include captions as part of the figure files themselves or submit them in a separate document.

At a minimum, include the following in your figure captions:

- A figure label with Arabic numerals, and "Figure" abbreviated to "Fig" (e.g. Fig 1, Fig 2, Fig 3, etc). Match the label of your figure with the name of the file uploaded at submission (e.g. a figure citation of "Fig 1" must refer to a figure file named "Fig1.tif").
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Cite tables in ascending numeric order upon first appearance in the manuscript file.

Place each table in your manuscript file directly after the paragraph in which it is first cited (read order). Do not submit your tables in separate files.

Tables require a label (e.g., "Table 1") and brief descriptive title to be placed above the table. Place legends, footnotes, and other text below the table.

 [Read the guidelines for tables.](#)

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All data and related metadata underlying the findings reported in a submitted manuscript should be deposited in an appropriate public repository, unless already provided as part of the submitted article.

See [here](#) for instructions on providing underlying data to support blot and gel results.

 [Read our policy on data availability.](#)

Repositories may be either subject-specific (where these exist) and accept specific types of structured data, or generalist repositories that accept multiple data types. We recommend that authors select repositories appropriate to their field. Repositories may be subject-specific (e.g., GenBank for sequences and PDB for structures), general, or institutional, as long as DOIs or accession numbers are provided and the data are at least as open as CC BY. Authors are encouraged to select repositories that meet accepted criteria as trustworthy digital repositories, such as criteria of the Centre for Research Libraries or Data Seal of Approval. Large, international databases are more likely to persist than small, local ones.

 [See our list of recommended repositories.](#)

To support data sharing and author compliance of the PLOS data policy, we have integrated our submission process with a select set of data repositories. The list is neither representative nor exhaustive of the suitable repositories available to authors. Current repository integration partners include [Dryad](#) and [FlowRepository](#). Please contact data@plos.org to make recommendations for further partnerships.

Instructions for PLOS submissions with data deposited in an integration partner repository:

- Deposit data in the integrated repository of choice.
- Once deposition is final and complete, the repository will provide you with a dataset DOI (provisional) and private URL for reviewers to gain access to the data.
- Enter the given data DOI into the full Data Availability Statement, which is requested in the Additional Information section of the PLOS submission form. Then provide the URL passcode in the Attach Files section.

If you have any questions, please [email us](#).

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Accession numbers (and version numbers, if appropriate) should be provided in the Data Availability Statement. Accession numbers or a citation to the DOI should also be provided when the data set is mentioned within the manuscript.

In some cases authors may not be able to obtain accession numbers or DOIs until the manuscript is accepted; in these cases, the authors must provide these numbers at acceptance. In all other cases, these numbers must be provided at submission.

Identifiers

As much as possible, please provide accession numbers or identifiers for all entities such as genes, proteins, mutants, diseases, etc., for which there is an entry in a public database, for example:

Appendix 2: STROBE checklist

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Checklist
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	✓ p45
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	✓ p46
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	✓ p47
Objectives	3	State specific objectives, including any prespecified hypotheses	✓ p48
Methods			
Study design	4	Present key elements of study design early in the paper	✓ p49-52
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	✓ p48
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	✓ p48
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	✓ p50-52
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	✓ p50-52
Bias	9	Describe any efforts to address potential sources of bias	✓ p52
Study size	10	Explain how the study size was arrived at	✓ p48
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	✓ p52
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	✓ p52
		(b) Describe any methods used to examine subgroups and interactions	✓ p52
		(c) Explain how missing data were addressed	✓ p50
		(d) If applicable, describe analytical methods taking account of sampling strategy	✓ p52
		(e) Describe any sensitivity analyses	NA
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	✓ p53
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	✓ p53,54
		(b) Indicate number of participants with missing data for each variable of interest	✓ p54
Outcome data	15*	Report numbers of outcome events or summary measures	✓ p54
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	✓ p55
		(b) Report category boundaries when continuous variables were categorized	✓ p50-52

		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	✓ Table 1-3
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	✓ p52,54 RDS
Discussion			
Key results	18	Summarise key results with reference to study objectives	✓ p61-63
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	✓ p62-63
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	✓ p63
Generalisability	21	Discuss the generalisability (external validity) of the study results	✓ p63
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	NA

Appendix 3: Johns Hopkins ethical approval amendment

Institutional Review Board Office

615 N. Wolfe Street / Room E1100
Baltimore, Maryland 21205-2179
Phone: 410-955-3193
Toll Free: 1-888-262-3242
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**AMENDMENT APPROVAL NOTICE
EXPEDITED REVIEW**

Date: May 4, 2017

To: Stefan Baral, MD
Department of Epidemiology

From: Joann Katz, ScD
Chair, IRB-FC

Re: Study Title: "Enhanced efforts to get infants and children in Port Elizabeth into health care programs"
IRB No: 00006441

The JHSPH IRB received the amendment request described below on May 1, 2017.
The IRB reviewed and approved this request on May 3, 2017.

This amendment approval is:

To add Johannes (Joe) Rossouw as a student investigator to the study team.

As a reminder, no other changes to this study may be implemented without prior JHSPH IRB review and approval.

The action taken on this study does not change the IRB expiration date, which remains May 10, 2017.

If you have any questions regarding this action, please contact the JHSPH IRB Office at (410) 955-3193 or via email at jhsph.irboffice@jhu.edu.

JK:lm



UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee



Room E53-46 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492
Email: sumayah.ariesdien@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

11 June 2019

HREC REF: 361/2019

Prof L Myer
Division of Epidemiology & Biostatistics
School of Public Health & Family Medicine
Falmouth Building-FHS

Dear Prof Myer

PROJECT TITLE: DEPRESSION AND ITS RELATIONSHIP TO DRIVERS OF HIV TRANSMISSION AMONG FEMALE SEX WORKERS IN PORT ELIZABETH, SOUTH AFRICA: A SECONDARY ANALYSIS OF A CROSS-SECTIONAL RESPONDENT-DRIVEN SAMPLING STUDY (MMED CANDIDATE - MR J ROSSOUW)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee (HREC) for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30 June 2020.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

Please quote the HREC REF in all your correspondence.

We acknowledge that the student: Mr Johannes Rossouw will also be involved in this study.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

Yours sincerely

Signature removed to avoid exposure online

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637.

Institutional Review Board (IRB) number: IRB00001938
NHREC-registration number: REC-210208-007

This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use: Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2006), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines. The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code of Federal Regulation Part 312.41 and 312.61.

Appendix 5: Survey questionnaire

Port Elizabeth FSW Questionnaire

Coupon ID: _____

Information Required for ALL POTENTIALLY ELIGIBLE INDIVIDUALS

Day Month Year Interviewer ID

Unique (D (Place Label))

L	L	L	L	N	N	N	N	L	L

*L= Letter

*N= Number

Example: AAAA0101AA

1. What are the first two letters of the city/village in which you were born? (L₁L₂)
2. What are the first two letters of the month in which you were born? (L₃L₄)
3. How many living brothers from the same mother do you have? (use 0# or 00 for less than ten or zero brothers from the same mother, respectively) (N₁N₂)
4. How many living sisters from the same mother do you have? (use 0# or 00 for less than ten or zero sisters from the same mother, respectively) (N₃N₄)
5. What are the first two letters of the area (neighborhood) in which you currently live? (L₅L₆)

Eligibility Screener [Interviewer: all eligibility questions must be asked and recorded]

No.	Question	Coding	Response
A.	How old are you? [Younger than 18=Not eligible; 18 or older=Eligible]	[Age in years]	
B.	Were you born female?	00= No [Not eligible] 01= Yes [Eligible]	
C.	Do you identify as a woman?	00= No [Not eligible] 01= Yes [Eligible]	
D.	Have you previously participated in this study with a coupon in the last 6 months?	00= No [Eligible] 01= Yes [Not eligible]	
E.	In the last 12 months, did you make most of your income (at least 50%) from exchanging sex for money?	00= No [Not eligible] 01= Yes [Eligible]	
F.	Do you currently live in Port Elizabeth?	00= No [Not eligible] 01= Yes [Eligible]	
[Interviewer: Read consent script if participant is eligible thus far. If the individual is ineligible based on the above criteria, enter 'No' ('00') in question G and please thank him/her for his/her time. If this person is eligible based on responses to questions A-F but you believe this person has entered the study previously or, for some other reason, is ineligible, please enter 'No' ('00') here and complete the following questions (H-K). You may then end the survey in the same manner as the other ineligible participants. Please use your best discretion.]			

No.	Question	Coding	Response
G.	Is this person eligible?	00= Eligible [continue with survey, starting with Module 1] 01= Not eligible [answer questions F through I, and then STOP]	
H.	Is this person ineligible because she is under the influence of alcohol or other drugs?	00= No 01= Yes	
I.	Is this person ineligible because she is otherwise mentally incapable of giving informed consent or completing the survey?	00= No 01= Yes	
J.	Is this person ineligible because you believe she has entered the study previously (even if she did not say so in question D)?	00= No 01= Yes	
K.	Is this person ineligible for another reason not listed above? If so, please specify the reason(s).	00= No 01= Yes (specify) Specify: _____	

Instructions to interviewers: For those questions with instructions to do so, read each question option, except "Refusal" or "Don't know". Select only one option per question. Do not read instructions in italics aloud.

Module 1--Demographic and Socioeconomic Information

"This first set of questions is about your background, such as where you live, your education, and your current work. Your answers are completely voluntary, and you are free to skip questions if you do not feel comfortable answering them."

No.	Question	Coding	Response
1.1	In what country were you born?	00= South Africa 01= Lesotho [skip to 1.3] 02= Mozambique [skip to 1.3] 03= Swaziland [skip to 1.3] 04= Zimbabwe [skip to 1.3] 05= Other (specify) [skip to 1.3] Specify: _____ 88= Refusal [skip to 1.3]	
1.2	In what province were you born?	00= Eastern Cape 01= Free State 02= Gauteng 03= KwaZulu-Natal 04= Limpopo 05= Mpumalanga 06= Northern Cape 07= North West 08= Western Cape 88= Refusal 99= Don't know	

No.	Question	Coding	Response																					
	1.3 Approximately how many total years have you lived in South Africa?	<i>[Record the number in years. Write 00 if less than 1 year]</i> 88= Refusal 99= Don't know	___																					
1.4	In the <u>last 12 months</u> , have you lived outside of South Africa?	00= No 01= Yes 88= Refusal	___																					
1.5	In the <u>last 12 months</u> , how many different villages or cities have you lived in?	<i>[Record the number of villages or cities. Write 01 if the participant has not moved/only lived in one village or city in the last 12 months.]</i> 88= Refusal	___																					
1.6	Approximately how many years have you lived in Port Elizabeth?	<i>[Record the number in years. Write 00 if less than 1 year]</i> 88= Refusal <i>[If lived in PE for entire life, skip to 1 .8]</i>	___																					
	1.7 What brought you to Port Elizabeth? I will read you a list of possible reasons. For each one please tell me whether it applies to your situation or not.	<table border="1"> <thead> <tr> <th>No (00)</th><th>Yes (01)</th><th>Refusal (88)</th></tr> </thead> <tbody> <tr> <td>☐</td><td>☐</td><td>☐</td></tr> <tr> <td>☐</td><td>☐</td><td>☐</td></tr> <tr> <td>☐</td><td>☐</td><td>☐</td></tr> <tr> <td>☐</td><td>☐</td><td>☐</td></tr> <tr> <td>☐</td><td>☐</td><td>☐</td></tr> <tr> <td>☐</td><td>☐</td><td>☐</td></tr> </tbody> </table>	No (00)	Yes (01)	Refusal (88)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	Response
No (00)	Yes (01)	Refusal (88)																						
☐	☐	☐																						
☐	☐	☐																						
☐	☐	☐																						
☐	☐	☐																						
☐	☐	☐																						
☐	☐	☐																						
	1.7a = To make money or to get a job	☐	___																					
	1.7b = For education or training	☐	___																					
	1.7c = Moved to PE with family or to be with family (e.g. parents, siblings, etc.)	☐	___																					
	1.7d = For marriage or to find a partner	☐	___																					
	1.7e = To practice sex work	☐	___																					
	1.7f = Other (specify) Specify: _____	☐	___																					
1.8	Thinking back to your childhood, did you primarily live in or near an urban center?	00= No, did not live in/near an urban center 01= Yes, lived in/near an urban center 88= Refusal	___																					
1.9	What is your religion?	00= Roman Catholic 01= Anglican 02= Protestant (any other type of Christian) 03= Muslim 04= Hindu 05= Traditional indigenous religion 06= Other (specify) Specify: _____ 88= Refusal	___																					
1.10	What is the highest level of education you have <u>completed</u> ?	<i>[List the highest grade level completed. If no formal education was completed, indicate 00.]</i> 13= some tertiary or post-secondary training 14= tertiary <u>degree</u> completed 88= Refusal	___																					

No.	Question	Coding	Response		
1.11	What is your current employment status (with regards to work that is NOT sex work)?	00= Unemployed 01= Self-employed 02= Employed by public or private sector (e.g. officially employed at a factory or in the government) 03= Student 04= Informal sector worker (e.g. informal domestic work, subsistence farming) 05= Other (specify) Specify: _____ 88= Refusal	___		
1.12	Approximately what is your income in an average week (in Rand)? This includes income from both formal and informal work, and from sex work as well as other jobs.	[Record the weekly income in ZAR] 88= Refusal 99= Don't know	_____		
1.13	Out of your average weekly income, how much comes from sex work (in Rand)?	[Record the amount in ZAR] 88= Refusal 99= Don't know	_____		
1.14	What best describes your <i>current</i> living arrangement? [Read response options aloud to participant]	00= No place to live/homeless 01= Renting place 02= Own place 03= Staying at someone else's place 04= School dormitory 05= Police or military barracks 06= Brothel 07= Other (specify) Specify: _____ 88= Refusal	___		
1.15	What is your current relationship status?	00= Single/not in a relationship 01= In a relationship (husband, partner, boyfriend, or girlfriend) 88= Refusal	___		
1.16	What is your <u>current</u> marital status?	00= Single/never married 01= Married 02= Divorced/separated 03= Widowed 04= Other (specify) Specify: _____ 88= Refusal	___		
1.17	In the place that you stay <u>currently</u> , who stays there with you on a regular basis? I will read a list of different types of people. For each, please tell me if that person lives with you.	No (00)	Yes (01)	Refusal (88)	Response
1.17a	No one, I live alone	☐	☐	☐	___
1.17b	Husband	☐	☐	☐	___
1.17c	Boyfriend, girlfriend, or other sexual partner (not including husband)	☐	☐	☐	___
1.17d	Relative(s) (including parents or siblings)	☐	☐	☐	___
1.17e	Children (yours or someone elses)	☐	☐	☐	___
1.17f	Friend(s), including schoolmates if in school	☐	☐	☐	___
1.17g	Co-worker(s) (not sex workers)	☐	☐	☐	___
1.17h	Other sex workers	☐	☐	☐	___

No.	Question	Coding			Response
1.17i	Other (specify) Specify _____	☐	☐	☐	___
1.18	Are <u>both</u> of your biological parents living?	00= Yes, <u>both</u> are living <i>[skip to Module 2]</i> 01= <u>Only one</u> parent is living 02= No, <u>neither</u> parent is living 88= Refusal <i>[skip to Module 2]</i> 99= Don't know <i>[skip to Module 2]</i>			___
1.19	Approximately how old were you when the first parent died?	<i>[Record age in years]</i> 88= Refusal 99= Don't know			___

Module 2--Human Rights and Exposure to Violations

“Now we are going to ask you questions about how you have felt or been treated by others because of your involvement in sex work. Please do not feel bad about answering as there are no right or wrong answers, and we will not tell anyone about what you will tell us. Your answers are completely voluntary, and you are free to skip questions if you do not feel comfortable answering them. For each question in this section and all sections of the survey, please respond according to YOUR personal experience (not those of other FSWs that you know).”

No.	Question	Coding				Response
	COMMUNITY	No (00)	Yes (01)	Not applicable (77)	Refusal (88)	
2.1	Have you <u>ever felt excluded</u> from family gatherings because you practice sex work?	☐	☐	☐	☐	___
2.2	Have you <u>ever felt</u> that family members have made discriminatory remarks or gossiped about you because you practice sex work?	☐	☐	☐	☐	___
2.3	Have you <u>ever felt rejected</u> by your <u>friends</u> because you practice sex work?	☐	☐	☐	☐	___
2.4	Are there <u>safe</u> places in your area where you can go to socialize with other sex workers (e.g. associations, friends' houses, groups, etc.)?	☐	☐		☐	___

No.	Question	Coding			Response
	HEALTH SYSTEM	No (00)	Yes (01)	Refusal (88)	
2.5	Have you ever <u>felt afraid</u> to go to health care services because you worry someone may learn you practice sex work?	☐	☐	☐	___
2.6	Have you ever <u>avoided</u> going to health care services because you worry someone may learn you practice sex work?	☐	☐	☐	___
2.7	Have you ever been <u>denied</u> health services (or someone kept you from receiving health services) because you practice sex work?	☐	☐	☐	___
2.8	Have you ever <u>felt</u> that you were <u>not treated well</u> in a health center because you practice sex work?	☐	☐	☐	___
2.9	Have you <u>ever heard</u> health care providers gossiping about you (talking about you) because you practice sex work?	☐	☐	☐	___

No.	Question	Coding	Response		
	SOCIETY				
2.10	Have you <u>ever felt</u> that the police refused to protect you because you practice sex work?	00= No 01= Yes 88= Refusal			
2.11	Have you <u>ever avoided</u> carrying condoms because you were afraid that they might get you in trouble with the police?	00= No 01= Yes 88= Refusal			
2.12	How would you describe your relationship, in general, with police? <i>[Read response options aloud to participant]</i>	00= Bad 01= Neutral (neither good nor bad) 02= Good 88= Refusal 99= Don't know			
2.13	Have police <u>ever harassed</u> or intimidated you for being a sex worker?	00= No 01= Yes 88= Refusal			
2.14	Have you <u>ever</u> seen or heard about police confiscating or destroying condoms held by a sex worker (including you) or outreach worker?	00= No 01= Yes 88= Refusal			
2.15	Have you <u>ever been</u> arrested? <i>[specify here "arrested" is different than "been to prison" –question 2.17]</i>	00= No <i>[skip to 2.19]</i> 01= Yes 88= Refusal <i>[skip to 2.19]</i>			
	2.16 Have you <u>ever</u> been arrested on charges related to sex work?	00= No 01= Yes, in the last 12 months 02= Yes, but not in the last 12 months 88= Refusal			
	2.17 Have you <u>ever been</u> kept in jail or prison?	00= No <i>[skip to 2.19]</i> 01= Yes 88= Refusal <i>[skip to 2.19]</i>			
	2.18 When you were in jail or prison, was this due to charges related to sex work?	00= No 01= Yes, and this was in the last 12 months 02= Yes, but not in the last 12 months 88= Refusal 99= Don't know			
No.	Question	No (00)	Yes (01)	Refusal (88)	Response
2.19	Has someone <u>ever</u> verbally harassed you and you <u>felt</u> it was because you practice sex work?	☐	☐	☐	
2.20	Has someone <u>ever blackmailed</u> you because you practice sex work?	☐	☐	☐	
2.21	Has someone <u>ever</u> physically hurt you (pushed, shoved, slapped, hit, kicked, choked, or otherwise physically hurt you)?	☐ <i>[skip to 2.25]</i>	☐	☐ <i>[skip to 2.25]</i>	
	2.22 Was this before or after the time when you started practicing sex work?	00= Before 01= After 02= Both before and after 88= Refusal 99= Don't remember			

No.	Question	Coding	Response
	2.23 Approximately how many times has someone physically hurt you in any way in the past 12 months?	<i>[Record the number of times. If 00, skip to 2.25]</i> 88= Refusal 99= Don't know →	□□□□ If 0 → 2.25
	2.24 Who was the person who physically hurt you? I will read you the following options, and please tell me for each one how many times this type of person beat you up or physically hurt you in the past 12 months.		
	2.24a = Regular client	<i>[Record the number of times]</i> 88= Refusal; 99= Don't know	□□□□
	2.24b = New/one time client	<i>[Record the number of times]</i> 88= Refusal; 99= Don't know	□□□□
	2.24c = Husband, boyfriend or any current or past non-paying sexual partner	<i>[Record the number of times]</i> 88= Refusal; 99= Don't know	□□□□
	2.24d = Another sex worker	<i>[Record the number of times]</i> 88= Refusal; 99= Don't know	□□□□
	2.24e = Pimp, boss (involved in sex work)	<i>[Record the number of times]</i> 88= Refusal; 99= Don't know	□□□□
	2.24f = Uniformed officer (police, military, security officer)	<i>[Record the number of times]</i> 88= Refusal; 99= Don't know	□□□□
	2.24g = Friend (excluding boyfriend, other sex partner or other sex workers)	<i>[Record the number of times]</i> 88= Refusal; 99= Don't know	□□□□
	2.24h = Family member including parents, siblings, and relatives	<i>[Record the number of times]</i> 88= Refusal; 99= Don't know	□□□□
	2.24i = Someone from your neighborhood	<i>[Record the number of times]</i> 88= Refusal; 99= Don't know	□□□□
	2.24j = Stranger	<i>[Record the number of times]</i> 88= Refusal; 99= Don't know	□□□□
	2.24k = Other (specify) Specify: _____	<i>[Record the number of times]</i> 88= Refusal; 99= Don't know	□□□□
2.25	Has someone <u>ever</u> forced you to have sex when you did not want to? (By <u>forced</u> , I mean physically forced, coerced to have sex, or penetrated with an object, when you did not want to).	00= No <i>[skip to Module 3]</i> 01= Yes 88= Refusal <i>[skip to Module 3]</i> 99= Don't know <i>[skip to Module 3]</i>	□□□
	2.26 Was this before or after you started practicing sex work?	00= Before 01= After 02= Both before and after 88= Refusal 99= Don't remember	□□□
	2.27 Approximately how many times has someone <u>ever</u> forced you to have sex when you did not want to?	<i>[Record the number of times]</i> 88= Refusal 99= Don't remember	□□□
	2.28 Approximately how many times has someone forced you to have sex when you did not want to <u>in the past 12 months</u> ?	<i>[Record the number of times. If 0, skip to 2.30.]</i> 88= Refusal 99= Don't remember →	□□□ If 0 → 2.30

No.	Question	Coding				Response
	2.29 In the past 12 months when you were forced to have sex when you did not want to, how many times was a condom used?	[Record the number of times] 88= Refusal 99= Don't remember				
	2.30 How would you classify the person(s) who forced you to have sex? I will read you the following options, and please tell me for each one whether this type of person ever forced you to have sex when you did not want to.	No (00)	Yes (01)	Refusal (88)	Response Code	Number times in past 12 months?
	2.30a = Regular client	☐	☐	☐		
	2.30b = New/one time client	☐	☐	☐		
	2.30c = Husband, boyfriend or any current or past non-paying sexual partner	☐	☐	☐		
	2.30d = Another sex worker	☐	☐	☐		

No.	Question	Coding			Response	
		No (00)	Yes (01)	Refusal (88)	Response Code	Number times in past 12 months?
	2.30e = Pimp, boss (involved in sex work)	☐	☐	☐		
	2.30f = Uniformed officer (police, military, security officer)	☐	☐	☐		
	2.30g = Friend	☐	☐	☐		
	2.30h = Family member including parents, siblings, and relatives	☐	☐	☐		
	2.30i = Someone from your neighborhood	☐	☐	☐		
	2.30j = Stranger	☐	☐	☐		
	2.30k = Other (specify) Specify: _____	☐	☐	☐		

No.	Question	Coding				Response
	2.31 Approximately how old were you the <u>first time</u> someone forced you to have sex? (age in years)	[Record age in years] 88= Refusal 99= Don't know				
	2.32 After someone forced you to have sex, did you access any of the following services?	No (00)	Yes (01)	Refusal (88)	Don't know (99)	Response
	2.32a = Post-exposure prophylaxis (PEP) or ARV treatment to prevent HIV infection?	☐	☐	☐	☐	
	2.32b = Emergency contraception /"the morning after pill" to prevent pregnancy?	☐	☐	☐	☐	
	2.32c = Any health care services?	☐	☐	☐	☐	
	2.32d = Any police services?	☐	☐	☐	☐	

Module 3--Personal Network Size

"Now I will ask some questions that will help us to estimate the size of your personal social network. Again, please do not feel rushed. Take your time to reflect on each question and try to give your best estimate. Your answers are completely voluntary, and you are free to skip questions if you do not feel comfortable answering them."

No.	Question	Coding	Response
3.1	How many different women do you know personally who practice sex work? I.e. you know them and they know you, you have seen them in the <u>last 2 years</u> , and you could contact them if you needed to?	[Record the number of people numerically (i.e. 1, 2, 3...)] 88= Refusal	_____
3.2	Of these women, how many (in your response to 3.1) have you actually seen or talked to at least once in the <u>last 6 months</u> ?	[Record the number of people numerically (i.e. 1, 2, 3...)] 88= Refusal	_____
3.3	Of these, how many of these women (in your response to 3.1) have you actually seen or talked to at least once in the <u>last 7 days</u> ?	[Record the number of people numerically (i.e. 1, 2, 3...)] 88= Refusal	_____

Module 4—Reproductive Health

"Now I am going to ask you some questions about your reproductive health. Please do not feel bad about answering as we will not tell anyone about what you will tell us. Your answers are completely voluntary, and you are free to skip questions if you do not feel comfortable answering them."

No.	Question	Coding			Response
4.1	How many total times have you been pregnant in the past (including pregnancies that were miscarried or terminated)?	[Record the number of times. If participant has never been pregnant, enter as 00 and skip to 4.20] 88= Refusal			___
	4.2 What was the outcome of those pregnancies? Please tell me how many of your pregnancies have ended in each outcome.				
	4.2a = Live births	[Record the number, or 88 for refusal]			___
	4.2b = Stillbirths	[Record the number, or 88 for refusal]			___
	4.2c = Miscarriages	[Record the number, or 88 for refusal]			___
	4.2d = Terminations (abortions)	[Record the number, or 88 for refusal. If 00 or 88, skip to 4.7]			___
	4.3 For women terminating a pregnancy: When you terminated a pregnancy, where did it take place? I will read a list of places. For each one please tell me whether you ever terminated a pregnancy there.	No (00)	Yes (01)	Refusal (88)	Response
	4.3a = At my home or the home of a friend/family member	☐	☐	☐	___
	4.3b = At a government clinic/hospital	☐	☐	☐	___
	4.3c = At a private clinic/hospital	☐	☐	☐	___
	4.3d = At a backstreet location	☐	☐	☐	___
	4.3e = Other (specify) Specify: _____	☐	☐	☐	___

	4.4 In what country did this take place?	00= South Africa 01= Other (specify) Specify: _____ 88= Refusal			
	4.5 Who assisted you with the procedure? I will read a list of possible people. Please indicate anyone who helped <u>perform</u> the procedure or sold you drugs, herbs or other provisions to carry out the termination.	No (00)	Yes (01)	Refusal (88)	Response
	4.5a = No one assisted you	☐	☐	☐	
	4.5b = Friends/family members	☐	☐	☐	
	4.5c = Registered nurse or midwife	☐	☐	☐	
	4.5d = Medical doctor	☐	☐	☐	
	4.5e = Street doctor or traditional healer	☐	☐	☐	
	4.5f = Other (specify) Specify: _____	☐	☐	☐	
	4.6 Have you ever experienced a serious health complication related to a termination of pregnancy? If yes, please specify what that complication was.	00= No 01= Yes (specify) Specify: _____ 88= Refusal			
No.	Question	Coding			Response
	4.7 How old were you when you gave birth to your first child (regardless of whether or not the child is still living today)?	<i>[Record the age, using two digits to express the number (i.e.: 09, 10, 11)]</i> If never had a live birth, indicate 00 & skip to 4.14 88= Refusal			
	4.8 How many of your biological children are currently living?	<i>[Record the number of children who are currently living. If 00, skip to 4.14.]</i> 88= Refusal			
	4.9 What are the ages of your (living) biological children?	<i>[Please list ages from youngest to oldest. If child is less than 1 yr list 00]</i> Child 1: Child 2: Child 3: Child 4: Child 5: Child 6:			
	4.10 Regarding those children, how many of them live with you right now?	<i>[Record 00=No, 01=Yes, or 88=Refusal for each child from youngest to oldest and confirm that the total is correct]</i> Child 1: Child 2: Child 3: Child 4: Child 5: Child 6: <i>Total living with participant:</i> If all children live with participant, skip to 4.14			

	4.11 On average, how often do you see your children <18 that do not live with you?	00= Everyday 01= Weekly 02= Monthly 03= Every few months 04= Once per year 05= Less than once per year 88= Refusal			
	4.12 On average, how long by car or taxi does it take for you to go and see them?	<i>[Record the number in hours, using two digits to express the number (i.e.: 02, 03, 04; enter 00 for less than 1 hour)]</i> 88= Refusal			
	4.13 Who do your children stay with? I will read a list of possible people and for each, please indicate whether any of your children stay with them.	No (00)	Yes (01)	Refusal (88)	Response
	4.13a = Their grandparent(s)	☐	☐	☐	
	4.13b = Their aunt/uncle	☐	☐	☐	
	4.13c = Another sibling of theirs	☐	☐	☐	
	4.13d = Other relatives	☐	☐	☐	
	4.13e = Friends	☐	☐	☐	
	4.13f = Foster/adoptive parents	☐	☐	☐	
	4.13g = Other (specify) Specify: _____	☐	☐	☐	
No.	Question	Coding			Response
	4.14 The <u>last</u> time that you gave birth, did you go to the clinic for antenatal care during your pregnancy? This is care that you receive from health care providers during your pregnancy to ensure that you and your baby are well, and to promote a healthy pregnancy.	00= No <i>[skip to 4.18]</i> 01= Yes 88= Refusal <i>[skip to 4.18]</i> 99= Don't remember <i>[skip to 4.18]</i>			
	4.15 During this same pregnancy, where did you seek antenatal services? I will read a list of possible places. Please let me know if you sought antenatal services there.	No (00)	Yes (01)	Refusal (88)	Response
	4.15a = Government clinic or public hospital	☐	☐	☐	
	4.15b = Private clinic or private hospital	☐	☐	☐	
	4.15c = Other (specify) Specify: _____	☐	☐	☐	
	4.16 Were you asked by the clinic nurses or staff to bring your male partner?	00= No 01= Yes 88= Refusal 99= Don't know			
	4.17 Have you ever been denied antenatal care because a male partner didn't attend the clinic with you?	00= No 01= Yes 88= Refusal 99= Don't know			
	4.18 The <u>last</u> time you gave birth, where did you deliver? <i>[Read response options aloud to participant]</i>	00= Government clinic or public hospital 01= Private clinic or private hospital 02= At home with the assistance of my family or friends			

		03= At home with the local midwife or health professional 04= Other (specify) Specify : _____ 88= Refusal	
	4.19 Have you <u>ever had</u> a pregnancy that was unwanted/unplanned? What I mean by that is, <u>at the time when you found out you were pregnant</u> , you did not want or intend to be pregnant then.	00= No 01= Yes 88= Refusal 99= Don't know	
4.20	How many <u>non-biological children for whom you are one of the primary caregivers</u> live with you?	<i>[Record the number of non-biological children]</i> 88= Refusal	
4.21	Are you currently pregnant?	00= No <i>[skip to 4.27]</i> 01= Yes 88= Refusal <i>[skip to 4.27]</i> 99= Don't know <i>[skip to 4.27]</i>	
	4.22 Was this pregnancy planned or unplanned?	00= Unplanned 01= Planned 88= Refusal 99= Don't know	
	4.23 How many weeks pregnant are you now? If you don't know for sure, just give your best estimate.	<i>[Record number of weeks.] If participant does not know, probe and record date of start of last menstrual period dd/mm/yy</i> _____ 88= Refusal 99= Don't know	
No.	Question	Coding	Response
	4.24 Have you attended an antenatal clinic during this pregnancy?	00= No <i>[skip to 4.28]</i> 01= Yes 88= Refusal	
	4.25 How many times have you visited an antenatal clinic during this pregnancy?	<i>[Record number of ANC visits]</i> 88= Refusal	
	4.26 How many weeks pregnant were you at the time of your first ANC visit?	<i>[Record number of weeks]</i> 88= Refusal 99= Don't know	 <i>[skip to 4.28]</i>
4.27	Are you <u>currently</u> trying to become pregnant?	00= No <i>[skip to 4.33]</i> 01= Yes 88= Refusal <i>[skip to 4.33]</i> 99= Don't know <i>[skip to 4.33]</i>	
	4.28 Who are you having a baby with or trying to get pregnant with?	00= Husband or steady boyfriend/partner 01= Casual non-paying partner 02= Regular client 03= Ex-husband / partner / boyfriend 88= Refusal 99= Don't know / no one in particular	
	4.29 What is the HIV status of the partner which you are having a baby with or trying to have a baby with?	00= HIV uninfected 01= HIV infected <i>[skip to 4.31]</i> 88= Refusal 99= Don't know	

	4.30 Has the partner you are having a baby with or trying to have a baby with been tested for HIV in the past 12 months?	00= No <i>[skip to 4.32]</i> 01= Yes <i>[skip to 4.32]</i> 88= Refusal <i>[skip to 4.32]</i> 99= Don't know <i>[skip to 4.32]</i>	_ _ <i>[skip to 4.32]</i>		
	4.31 Is the partner that you are having a baby with or trying to have a baby with on ARVs?	00= No 01= Yes 88= Refusal 99= Don't know	_ _		
	4.32 Does the partner you are having a baby with or trying to have a baby with know what your HIV status is?	00= No <i>[skip to 4.35]</i> 01= Yes <i>[skip to 4.35]</i> 88= Refusal <i>[skip to 4.35]</i> 99= Don't know <i>[skip to 4.35]</i>	_ _ <i>[skip to 4.35]</i>		
4.33	How important is it for you to avoid getting pregnant <u>now</u> ?	00= Not important 01= Important 88= Refusal 99= Don't know	_ _		
4.34	Do you hope or plan to have a child or more children in the future?	00= No 01= Yes 88= Refusal 99= Don't know	_ _		
No.	Question	Coding			Response
4.35	Many people in South Africa who are thinking about having children are affected by HIV. For couples in which one or both partners are living with HIV, what ways have you heard of for couples to get pregnant without infecting each other or the baby? [Do not read responses – mark all that apply.]	No (00)	Yes (01)	Refusal (88)	Response
	4.35a = ARVs for the infected partner	☐	☐	☐	_ _
	4.35b = PrEP for the uninfected partner	☐	☐	☐	_ _
	4.35c = ARVs, AZT, NVP, or tablets when pregnant	☐	☐	☐	_ _
	4.35d = Self-insemination	☐	☐	☐	_ _
	4.35e = Timed intercourse only when ovulating	☐	☐	☐	_ _
	4.35f = Sperm-washing and/or in-vitro fertilization	☐	☐	☐	_ _
	4.35g = Using a sperm donor	☐	☐	☐	_ _
	4.35h = Adoption	☐	☐	☐	_ _
	4.35i = Other (specify) Specify: _____	☐	☐	☐	_ _
	4.35j = Don't know of any methods	☐	☐	☐	_ _
4.36	I am going to read you a list of different methods that women may use to prevent pregnancy. For each method I mention, please tell me if you are <u>currently</u> using it. Some women use more than one method, so you can say more than one.	No (00)	Yes (01)	Refusal (88)	Response
	4.36a = Birth control pill	☐	☐	☐	_ _
	4.36b = Intrauterine contraception device (IUD or IUCD), such as the “loop”	☐	☐	☐	_ _

	4.36c = Injectable birth control, such as Depo Provera (DMPA) or Nuristerate (Net-En)	☐	☐	☐	
	4.36d = Implant (rods/sticks), such as Norplant or Jadelle	☐	☐	☐	
	4.36e = Male condom	☐	☐	☐	
	4.36f = Female condom	☐	☐	☐	
	4.36g = Diaphragm or cervical cap	☐	☐	☐	
	4.36h = Rhythm Method	☐	☐	☐	
	4.36i = Withdrawal	☐	☐	☐	
	4.36j = Female sterilization (bilateral tubal ligation). Also known as having one's tubes tied, this is a surgical procedure in which a woman's fallopian tubes are clamped and blocked, or severed and sealed, either method which prevents eggs from reaching the uterus for fertilization. Tubal ligation is considered a permanent method of birth control) <i>[if no, skip to 4.38]</i>	☐ <i>[skip to 4.38]</i>	☐	☐ <i>[skip to 4.38]</i>	

No.	Question	Coding	Response
	4.37 Did you choose on your own to get sterilized, or were you pressured, coerced, or forced to be sterilized?	00= Chose for myself 01= Pressured/coerced to sterilize 02= Forced to get sterilized 88= Refusal	
4.38	<i>Is the participant using a method of contraception other than condoms? (hormonal method or IUD)</i>	00= No <i>[skip to 4.43]</i> 01= Yes	
4.39	How long have you been using this (these) current method(s) of family planning? <u>You can respond in months or years.</u>	<i>[Enter EITHER number of years OR number of months]</i> Years: OR Months:	
4.40	Have you been having any problems with the method?	00= No <i>[skip to 4.42]</i> 01= Yes 88= Refusal 99= Don't know	
	4.41 What is the biggest problem that you have been experiencing with your current method? <i>Do not read answers. Mark only one response.</i>	00= Heavy bleeding or irregular bleeding 01= No period, amenorrhea 02= Wet vagina 03= Weight gain 04= Headaches 05= Abdominal pain/cramping 06= Partner does not like or agree to method 07= Difficult to remember to take the pill everyday 08= Difficult to regularly get injections 09= Difficult to get prescription filled 10= Other (specify) Specify: _____ 88= Refusal 99= Don't know	

4.42	In the next month, do you plan on continuing with the same method of family planning, start using a new method or stop using contraception?	00= Continue with same method <i>[skip to 4.44]</i> 01= Start new method <i>[skip to 4.44]</i> 02= Stop using method <i>[skip to 4.44]</i> 88= Refusal <i>[skip to 4.44]</i> 99= Don't know <i>[skip to 4.44]</i>	 <i>[skip to 4.44]</i>
4.43	What is the main reason that you are not using another method for family planning other than condoms?	00= Trying to get pregnant 01= Do not think that I can get pregnant 02= I am not having my period, amenorrhea 03= Non-paying partner does not approve 04= Side effects of the method 05= Method too difficult 06= Heavy or irregular bleeding 07= Do not know which method to use 08= No time for method 09= Other (specify) Specify: _____ 88= Refusal 99= Don't know	

No.	Question	Coding			Response
4.44	Have you ever heard of emergency contraception or the morning after pill, which is medication that you can take after unprotected sex to prevent pregnancy?	00= No <i>[skip to Module 5]</i> 01= Yes 88= Refusal <i>[skip to Module 5]</i> 99= Don't know <i>[skip to Module 5]</i>			
4.45	Do you know where you could go to get emergency contraception if you needed it?	00= No 01= Yes (specify) Specify: _____ 88= Refusal			
4.46	Have you ever obtained or received emergency contraception?	00= No <i>[skip to Module 5]</i> 01= Yes 88= Refusal <i>[skip to Module 5]</i>			
	4.47 How many times have you obtained and taken emergency contraception?	<i>[Record the number of times.]</i> 88= Refusal 99= Don't know			
	4.48 When you have obtained emergency contraception, where or from which organization did you obtain it? I will read several options. For each one, please tell me if you have <u>ever obtained</u> emergency contraception from that source.	No (00)	Yes (01)	Refusal (88)	Response
	4.48a = Government clinic/hospital	☐	☐	☐	
	4.48b = Private clinic/hospital	☐	☐	☐	
	4.48c = Pharmacy/chemist	☐	☐	☐	
	4.48d = Traditional healer	☐	☐	☐	
	4.48e = Marie Stopes	☐	☐	☐	
	4.48f = Other (specify) Specify: _____	☐	☐	☐	

Module 5--Personal History

“Now we are going to ask you questions about the time in which you have been involved in sex work. Please do not feel bad about answering as we will not tell anyone about what you will tell us. Your answers are completely voluntary, and you are free to skip questions if you do not feel comfortable answering them.”

No.	Question	Coding	Response
5.1	How old were you the first time you had sex?	[Record age in years] 88= Refusal	
5.2	Approximately how old were you the <u>first time</u> you provided sexual acts in exchange for money?	[Record age in years] 88= Refusal 99= Don't remember	
5.3	Approximately how old were you the <u>first time</u> you provided sexual acts in <u>exchange</u> for favors or goods?	[Record age in years, with 00 to indicate not applicable] 88= Refusal 99= Don't remember	
5.4	Have you <u>ever</u> temporarily stopped practicing sex work for more than a month?	00= No [skip to 5.6] 01= Yes 88= Refusal [skip to 5.6] 99= Don't remember [skip to 5.6]	
	5.5 Of the following, which was the <u>main</u> reason you stopped practicing sex work? Select the reason that is <u>most</u> applicable. [Read response options aloud to participant]	00= Was sick/ physically could not work 01= Was pregnant/gave birth to a child/was breastfeeding 02= Had other work/other job 03= There was no demand for sex work 04= Short-term migration/travel 05= Only practice sex work in destination sites, not where I live 06= Other (specify) Specify: _____ 88= Refusal	
5.6	Approximately how many years <u>in total</u> have you been exchanging sex for money? Please exclude the time when you were not practicing sex work.	[Record the number in years. If less than one year write 00.] 88= Refusal 99= Don't know	
5.7	How many children have you given birth to since you began practicing sex work?	[Record the number. If the participant has not given birth to any children since she began practicing sex work, write 00 and skip to 5.10] 88= Refusal [skip to 5.10]	
	5.8 For how many months did you practice sex work during your last pregnancy? For this question, we want to know how many months <i>into your pregnancy</i> , not the number of months since you found out you were pregnant.	[Record the number of months] 88= Refusal 99= Don't know	
	5.9 How many weeks or months old was your last baby when you started to practice sex work again?	[Record the number of weeks. If the participant started practicing sex work again less than a week after the birth, write 00.] 88= Refusal 99= Don't remember	Weeks Months

No.	Question	Coding	Response
5.10	Who introduced you to sex work? Select the person that is most applicable. <i>[Read response options aloud to participants]</i>	00= No one else was involved, made the decision on my own 01= Patron/boss/pimp/other person who manages sex work 02= Husband, (non-paying) partner, boyfriend 03= Friend 04= Family member (parent, sibling, other relative) 05= Other (specify) Specify: _____ 88= Refusal	

No.	Question	Coding			Response
		No (00)	Yes (01)	Refusal (88)	
5.11	What were the reasons you started practicing sex work? I will read you several possible reasons. For each, please tell me if it was a reason you started practicing sex work.				
	5.11a = It was the best job/opportunity available to me	☐	☐	☐	
	5.11b = I had to feed myself or my family	☐	☐	☐	
	5.11c = I had to pay rent for myself or my family	☐	☐	☐	
	5.11d = Someone talked me into it or pressured me	☐	☐	☐	
	5.11e = I was forced against my will (By forced, I mean physically forced or coerced into sex work)	☐	☐	☐	
	5.11f = Other (specify) Specify: _____	☐	☐	☐	
5.12	Why do you <u>currently</u> practice sex work?	No (00)	Yes (01)	Refusal (88)	Response
	5.12a = It is the best job/opportunity available to me	☐	☐	☐	
	5.12b = I have to feed myself or my family	☐	☐	☐	
	5.12c = I have to pay rent for myself or my family	☐	☐	☐	
	5.12d = Someone is pressuring me to continue sex work	☐	☐	☐	
	5.12e = I am being coerced or forced	☐	☐	☐	
	5.12f = Other Specify: _____	☐	☐	☐	
5.13	How many <u>other</u> people are financially supported by your sex work? (adults and children excluding yourself)	[Record the number of people] 88= Refusal			
5.14	Have you told <u>any member</u> of your family that you practice sex work?	00= No [skip to 5.16] 01= Yes 88= Refusal [skip to 5.16]			
	5.15 Which member(s) of your family did you tell? I will read a list of family members. For each one, please tell me whether you have told that family member that you practice sex work.	No (00)	Yes (01)	Refusal (88)	Response
	5.15a = Mother	☐	☐	☐	

No.	Question	Coding				Response
	5.15b = Father	☐	☐	☐	___	
	5.15c = Sister	☐	☐	☐	___	
	5.15d = Brother	☐	☐	☐	___	
	5.15e = Child	☐	☐	☐	___	
	5.15f = Husband/partner/boyfriend	☐	☐	☐	___	
	5.15g = Any other female relatives	☐	☐	☐	___	
	5.15h = Any other male relatives	☐	☐	☐	___	
5.16	Did anyone in your family find out that you practice sex work without you telling them?	00= No 01= Yes 88= Refusal				___
"Now think about your current work."						
5.17	On average, about how many clients do you have in a given 24-hour period when you are working?	[Record the number of clients] 88= Refusal				___
5.18	On average, how many days per month do you practice sex work?	[Record the number of days] 88= Refusal				___
5.19	In the <u>last 12 months</u> , in which provinces or countries did practice sex work? I will read a list of provinces to you. For each one, please tell me if you practiced sex work there and, if so, how many months you practiced sex work there out of the last 12 months. <i>[Read each response option aloud to the participant for a yes/no, then follow-up immediately after each one with the number of months]</i>	Yes (00)	No (01)	Refusal (88)	Response Code	Number of Months
	5.19a = Eastern Cape	☐	☐	☐	___	___
	5.19b = Free State	☐	☐	☐	___	___
	5.19c = Gauteng	☐	☐	☐	___	___
	5.19d = KwaZulu-Natal	☐	☐	☐	___	___
	5.19e = Limpopo	☐	☐	☐	___	___
	5.19f = Mpumalanga	☐	☐	☐	___	___
	5.19g = Northern Cape	☐	☐	☐	___	___
	5.19h = North West	☐	☐	☐	___	___
	5.19i = Western Cape	☐	☐	☐	___	___
	5.19j = Outside South Africa (specify country) Specify: _____	☐	☐	☐	___	___
5.20	Does the demand in the area in which you practice sex work change seasonally?	00= No 01= Yes 88= Refusal 99= Don't know				___
5.21	Would you say that right now the number of clients that you have is higher than average, lower than average or about average?	00= Lower 01= Average 02= Higher 88= Refusal 99= Don't know				___

No.	Question	Coding	Response
“Now I would like to talk about your sexual behaviors. When I ask about sex, I mean vaginal or anal sex unless otherwise specified. When I ask about oral sex, I mean giving or receiving. That is, sexual activity in which either your partner is stimulating your genitals with his/her mouth, or you are stimulating the genitals of your partner using your mouth. When I ask about condoms, I am generally referring to male or female condoms. Also, unless I say otherwise, I am referring to using a new condom for each sexual act and with each partner, and I mean that the condom was used for the entire penetrative sexual act. Please remember that your answers are completely voluntary, and you are free to skip questions if you do not feel comfortable answering them.”			
5.22	In the past 7 days, how many <u>different men</u> did you have vaginal or anal sex with?	<i>[Record the number of sex partners]</i> 88= Refusal	
5.23	In the past 7 days, approximately how many <u>different non-paying men</u> did you have vaginal or anal sex with? This excludes clients.	<i>[Record the number of sex partners]</i> 88= Refusal 99= Don't know	
5.24	In the <u>past 7 days</u> , approximately how many <u>times</u> did you have <u>vaginal</u> sex?	<i>[Record the number of sex acts]</i> 88= Refusal 99= Don't know	
No.	Question	Coding	Response
5.25	In the <u>past 7 days</u> , approximately how many <u>times</u> did you have <u>anal</u> sex?	<i>[Record the number of sex acts]</i> 88= Refusal 99= Don't know	
5.26	In the <u>last 12 months</u> have you had <u>vaginal</u> sex?	00= No <i>[skip to 5.28]</i> 01= Yes 88= Refusal <i>[skip to 5.28]</i>	
	5.27 Of the times you had <u>vaginal</u> sex in the <u>last 12 months</u> , how often was a condom used? <i>[Read response options aloud to participants]</i>	00= Never 01= Almost never 02= Sometimes 03= Almost always/often 04= Always 88= Refusal	
5.28	In the <u>last 12 months</u> , have you had <u>anal</u> sex?	00= No <i>[skip to 5.30]</i> 01= Yes 88= Refusal <i>[skip to 5.30]</i>	
	5.29 Of the times you had <u>anal</u> sex in the <u>last 12 months</u> , how often was a condom used? <i>[Read response options aloud to participants]</i>	00= Never 01= Almost never 02= Sometimes 03= Almost always/often 04= Always 88= Refusal	
5.30	In the past 12 months when you have used a condom during vaginal or anal sex with a man, how often has the condom slipped off or broken?	00= Never 01= Almost never 02= Sometimes 03= Almost always/often 04= Always 88= Refusal	
5.31	How often do you carry condoms with you when you are working (sex work)?	00= Never 01= Almost never 02= Sometimes 03= Almost always/often 04= Always 88= Refusal 99= Don't know	

No.	Question	Coding	Response
5.32	Do you share your earnings with a person who provides some service (i.e. arranges clients for you, manages you, or provides protection for you) when you practice sex work?	00= No <i>[skip to Module 6]</i> 01= Yes 88= Refusal <i>[skip to Module 6]</i>	[[[
	5.33 Are you free to end this relationship or stop paying this person whenever you want?	00= No 01= Yes, and there is no consequence 02= Yes, but I have to pay money 03= Yes, but there are other consequences Specify: _____ 88= Refusal 99= Don't know	[[[
	5.34 Do you have sex with this person?	00= No <i>[skip to Module 6]</i> 01= Yes 88= Refusal <i>[skip to Module 6]</i>	[[[
	5.35 How often do you use condoms when you have sex with this person?	00= Never 01= Almost never 02= Sometimes 03= Almost always/often 04= Always 88= Refusal	[[[

Module 6 – Knowledge, Attitudes, Behavior

“Now I am going to ask you private questions about HIV prevention and sexual practices.

Please do not feel bad about answering as we will not tell anyone about what you will tell us.

Your answers are completely voluntary, and you are free to skip questions if you do not feel comfortable answering.”

No.	Question	Coding	Response
6.1	When was the last time you went to a clinic for your own health (public, private or mobile clinic)?	<i>Please give the month and year that last attended a clinic</i> 88= Refusal	Month [[Year [[
6.2	Did you tell the health care provider that you are a sex worker?	00= No 01= Yes <i>[skip to 6.4]</i> 88= Refusal	[[
6.3	Have you ever told a health care provider that you practice sex work?	00= No 01= Yes 88= Refusal	[[
6.4	Has a health care worker ever found out that you practice sex work without you telling them?	00= No 01= Yes 88= Refusal	[[
6.5	In the <u>last 12 months</u> , have you been tested for a sexually transmitted infection (such as syphilis, gonorrhea, Chlamydia, or herpes)?	00= No 01= Yes 88= Refusal	[[
6.6	In the <u>last 12 months</u> , have you been told by a doctor or other health care provider that you have a sexually transmitted infection (such as syphilis, gonorrhea, Chlamydia, or herpes)? I will read a list of possible infections. For each one, please tell me if you have been told by a doctor or other health care provider that you have this infection.	No (00) Yes (01) Refusal (88) Don't know (99)	Response
	6.6a = Syphilis	☐ ☐ ☐ ☐	[[

	6.6b = Gonorrhea / Chlamydia	☐	☐	☐	☐	___
	6.6c = Herpes / Genital ulcers	☐	☐	☐	☐	___
	6.6d = Human Papillomavirus (HPV) / warts	☐	☐	☐	☐	___
	6.6e = Hepatitis B	☐	☐	☐	☐	___
	6.6f = Hepatitis C	☐	☐	☐	☐	___
	6.6g = Other (specify) Specify: _____	☐	☐	☐	☐	___
6.7	In the <u>last 12 months</u> , have you had symptoms of a sexually transmitted infection including discharge from your vagina or sores on or around your vagina or anus?	☐ [skip to 6.9]	☐	☐ [skip to 6.9]	☐ [skip to 6.9]	___
	6.8 Was this infection treated by a doctor or other health care provider?	00= No, no treatment at all 01= Yes, treated by a doctor or other health care provider 02= No, self-treated 03= No, treated by a traditional healer 04= No, treated by another (specify) Specify: _____ 88= Refusal				___
No.	Question	Coding				Response
6.9	A pap smear is a test that is done to screen for cervical cancer in women. Have you <u>ever</u> had a pap smear?	00= No 01= Yes 88= Refusal				___
"Now, we are going to discuss HIV infection."						
6.10	To the best of your knowledge, have any of your family members in your household been told by a doctor, nurse, or counsellor that they have HIV?	00= No 01= Yes 88= Refusal				___
	6.11 Which members of your family are or were living with HIV? I will read you a list of family members. For each one, please tell me if that family member is / was living with HIV.	No (00)	Yes (01)	Refusal (88)	Don't know (99)	Response
	6.11a = Mother	☐	☐	☐	☐	___
	6.11b = Husband/cohabitating partner/main partner	☐	☐	☐	☐	___
	6.11c = Non-primary partner/boyfriend	☐	☐	☐	☐	___
6.12	Were you ever tested for HIV when you were pregnant?	00= No, I have never been pregnant [skip to 6.14] 01= No, I have been pregnant, but I was never tested during pregnancy [skip to 6.14] 02= Yes, I was tested at an antenatal visit 03= Yes, I was tested during delivery 04= Yes I was tested while pregnant, but not at an antenatal visit or during delivery 88= Refusal 99= Don't know				___

	6.13 During how many of your pregnancies were you tested for HIV (or already knew that you were living with HIV)? <i>[Hint: Refer to 4.1 for number of times she has been pregnant.]</i>	<i>[Record the number of pregnancies tested/diagnosed for. Note: cannot be more than total number of times pregnant]</i> 88= Refusal	___
6.14	How many times have you ever been tested for HIV?	<i>[Record the number of times tested. If NEVER TESTED, put 00 and skip to 6.33.]</i> 88= Refusal 99= Don't remember, but had a test	___
	6.15 How old were you the first time that you had an HIV test?	<i>[Record the age when first had an HIV test]</i> 88= Refusal 99= Don't remember, but had a test	___
	6.16 When was the last time you were tested for HIV?	<i>[Record the number of the month with two digits and the year with two digits, e.g. 0410 for April 2010]</i> 888= Refusal 999= Don't know	Month ___ Year ___
	6.17 Did you receive the results of your last HIV test?	00= No 01= Yes 88= Refusal	___
	6.18 Have you <u>ever been</u> told by a doctor or health care provider that you have HIV?	00= No <i>[skip to 6.33]</i> 01= Yes 88= Refusal <i>[skip to 6.33]</i>	___

No.	Question	Coding	Response
	6.19 When were you first told by a health care provider that you have HIV?	<i>[Record the number of the month with two digits and the year with two digits, e.g. 0410 for April 2010]</i> 888= Refusal 999= Don't know	Month ___ Year ___
	6.20 To determine when people should begin treatment for HIV, a test called a CD4 count is done. Have you <u>ever</u> been tested to learn what your CD4 levels are?	00= No, and I am <u>not</u> scheduled to have my CD4 levels monitored <i>[skip to 6.23]</i> 01= No, but I <u>am</u> scheduled to have my CD4 levels monitored <i>[skip to 6.23]</i> 02= Yes 88= Refusal <i>[skip to 6.23]</i> 99= Don't know <i>[skip to 6.23]</i>	___
	6.21 When was the last time you had a CD4 count done? <i>[Read response options aloud to the participant]</i>	00= Less than 12 months ago 01= Between 1 to 2 years ago 02= More than 2 years ago 88= Refusal 99= Don't know	___
	6.22 Do you know the results of your last CD4 test? If so, please specify what those results were.	00= No, did not receive results 01= No, can't remember results 02= Yes (specify) Specify: _____ 88= Refusal	___
	6.23 Have you been told by a doctor or other health care provider that you need to begin antiretroviral therapy (ARVs) to treat your HIV?	00= No 01= Yes 88= Refusal	___

	6.24 Have you ever been started on ARVs by a doctor or nurse?	00= No <i>[skip to 6.28]</i> 01= Yes 88= Refusal	[[[
	6.25 When did you first start taking antiretrovirals (ARVs)?	<i>[Record the number of the month with two digits and the year with two digits, e.g. 0410 for April 2010]</i> 888= Refusal 999= Don't know	Month [[[Year [[[
	6.26 Are you <u>currently</u> being treated with antiretrovirals (ARVs) for HIV? That is, are you taking ARV medication on a regular basis at this particular point in time?	00= No 01= Yes <i>[skip to 6.29]</i> 88= Refusal <i>[skip to 6.29]</i> 99= Don't know <i>[skip to 6.29]</i>	[[[
	6.27 When did you stop taking ARVs?	<i>[Record the number of the month with two digits and the year with two digits, e.g. 0410 for April 2010]</i> 888= Refusal 999= Don't know	Month [[[Year [[[

No.	Question	Coding	Response
	6.28 What is the <u>main</u> reason you no longer take antiretrovirals (ARVs) or haven't started antiretrovirals (ARVs)? <i>[Do not read – select only one]</i>	00= Did not like the medication side effects 01= Did not have regular access to food to take the medication with 02= Too busy to take medications 03= Too busy to go to clinic 04= Did not feel welcome at the clinic or other place where I was receiving treatment 05= Moved to a different area 06= Did not feel like the treatment was helping or was necessary 07= Did not see the need for treatment as I was feeling better 08= ARVs were not available/accessible 09= CD4 count was too high to start ARVs 10= Had difficult getting to the clinic 11= Worried people would find out I was living with HIV 12= Only took treatment while pregnant 13= Other (specify): _____ 88= Refusal 99= Don't know	[[[<i>[skip to 6.31]</i>
	6.29 Where do you get your antiretrovirals (ARVs)?	00= Public health facility / clinic 01= Private health facility / clinic 02= Mobile clinic 03= Purchase on the street / local supplier 04= Traditional healer 05= Church 06= Other, specify: _____ 88= Refusal	[[[
	6.30 There are many reasons why people may not take their ARV – such as they forgot, ran out of medicine, or did not have time or money to go to the clinic. In the past 30 days, how many days did you run out of ARVs or miss your ARVs for any reason?	<i>[Record the total number of days missed ARVs]</i> 88= Refusal	[[[

	6.31 Were you pregnant when you were first told you had HIV?	00= No 01= Yes 77= NA, never been pregnant [skip to 6.38] 88= Refusal					[[[	
	6.32 Have you ever received any specialized treatment when you were pregnant or breastfeeding to prevent the transmission of HIV to your child?	00= No, I have not been pregnant or breastfeeding since I was told I have HIV 01= No, I have been pregnant or breastfeeding since I was told I have HIV, but I did not receive treatment to prevent transmission of HIV to my child 02= Yes 88= Refusal					[[[	
	6.33 If you have children, has a doctor or health care provider told you that <u>any of your children have HIV</u> ?	00= No [skip to pre-6.35] 01= Yes 77= NA, no biological children [skip to 6.38] 88= Refusal 99= Don't know					[[[	
No.	Question	Coding					Response	
	6.34 Please give the ages of any children that you have that are living with HIV	[Record age of each HIV+ biological child] Child 1 Child 2 Child 3 88=Refusal					[[[[[[[[[	
	Pre-6.35 [See Q4.9 on page 10. How many children are under 5?]	[Record number of children under the age of 5 years. If 0, skip to 6.38]					[[[	
	6.35 For each of your children under 5, have they been tested for HIV? For each child who has been tested, please note if he or she was tested in the 6 to 10 weeks following birth, after cessation of breastfeeding, both after being born and after cessation of breastfeeding, or at some other time.	Never tested	Tested after birth only	Tested after breastfeeding	Both	Other (specify)	Refusal	Response
		(00)	(01)	(02)	(03)	(04)	(88)	
	6.35a = Child age _____	☐	☐	☐	☐	☐	☐	[[[
	6.35b = Child age _____	☐	☐	☐	☐	☐	☐	[[[
	6.35c = Child age _____	☐	☐	☐	☐	☐	☐	[[[
	6.35d = Child age _____	☐	☐	☐	☐	☐	☐	[[[
	6.36 For each of your children under 5, how long did you breastfeed?	Never (00)	≤ 6 months (01)	> 6 months (02)	Refusal (88)	Response		
	6.36a = Child age _____	☐	☐	☐	☐	[[[		
	6.36b = Child age _____	☐	☐	☐	☐	[[[		
	6.36c = Child age _____	☐	☐	☐	☐	[[[		
	6.36d = Child age _____	☐	☐	☐	☐	[[[		
	6.37 Are you currently breastfeeding?	00= No 01= Yes 88= Refusal					[[[	

"Thank you for your answers. I am now going to ask you some questions related to HIV disclosure. Remember, there are no right or wrong answers."					
	6.38 Have you told your long-term non-paying sexual partners (e.g. husband, boyfriend) that you are living with HIV?	00= No, none 01= Yes, some but not all 02= Yes, all (or the only one) 77= Not applicable, not in a relationship 88= Refusal			
	6.39 Have you told your casual non-paying sexual partners that you are living with HIV?	00= No, none 01= Yes, some but not all 02= Yes, all (or the only one) 77= Not applicable, no casual non-paying partners 88= Refusal			
	6.40 Have you told your clients that you are living with HIV?	00= No, none 01= Yes, some but not all 02= Yes, all (or the only one) 88= Refusal			
"Now I would like to talk about condoms. When I ask about condoms, I am generally referring to male or female condoms. Also, unless I say otherwise, I am referring to using a new condom for each sexual act and with each partner."					
No.	Question	Coding			Response
6.41	How difficult or easy is it for you to get condoms when you need them?	00= Very difficult 01= Somewhat difficult 02= Neither difficult nor easy 03= Somewhat easy 04= Very easy 88= Refusal			
6.42	In general, do you buy condoms or get them for free?	00= Buy them 01= Get them for free 02= Both 03= Neither <i>[skip to 6.47]</i> 88= Refusal			
	6.43 I will read you a list of places. For each one, please tell me if you get condoms there or not. If you get free condoms from peer educators or outreach workers, think of which organizations those individuals come from.	No (00)	Yes (01)	Refusal (88)	Response
	6.43a = Public areas, such as bathrooms or clubs	☐	☐	☐	
	6.43b = TB HIV Care Association / mobile	☐	☐	☐	
	6.43c = SWEAT	☐	☐	☐	
	6.43d = Government clinic / hospital	☐	☐	☐	
	6.43e = Community organizations	☐	☐	☐	
	6.43f = Stores or shops, such as petrol stations and pharmacies/chemists	☐	☐	☐	
	6.43g = Street vendors	☐	☐	☐	
	6.43h = Other (specify) Specify: _____	☐	☐	☐	
	6.44 In the past month, approximately how many condoms did you receive for free?	<i>[Record the number of condoms]</i> 88= Refusal 99= Don't know			

	6.45 In the <u>past month</u> , approximately how many condoms did you pay for?	<i>[Record the number of condoms]</i> 88= Refusal 99= Don't know	_ _ _
	6.46 Was that quantity sufficient (enough for your needs)?	00= No 01= Yes 88= Refusal	_ _
6.47	In the <u>last 12 months</u> , how many times have you reused condoms with clients or non-paying partners?	<i>[Record number of times]</i> 88= Refusal 99= Don't know	_ _
6.48	Have you <u>ever used</u> lubricants during sex? These could include petroleum jelly or Vaseline, body creams/fatty creams, water-based lubricants (ex: Durex, Black Heat, Assegai), saliva, yogurt, egg whites, avocado or cooking oil.	00= No <i>[skip to 6.53]</i> 01= Yes, but only without condoms 02= Yes, but only with condoms 03= Yes, both with and without condoms 88= Refusal <i>[skip to 6.53]</i> 99= Don't know <i>[skip to 6.53]</i>	_ _
	6.49 How often do you use lubricants with condoms for <u>vaginal</u> sex?	00= Never 01= Almost never 02= Sometimes 03= Almost always/often 04= Always 88= Refusal	_ _
No.	Question	Coding	Response
	6.50 How often do you use lubricants with condoms for <u>anal</u> sex?	00= Never 01= Almost never 02= Sometimes 03= Almost always/often 04= Always 77= N/A: Never had anal sex 88= Refusal	_ _
	6.51 Which type of lubricant do you <u>most often</u> use for <u>vaginal</u> sex with men?	00= Petroleum jelly or Vaseline 01= Body creams / fatty creams 02= Water-based lubricant 03= Saliva 04= Cooking oil 05= Glycerin 06= Shea butter 07= Baby oil 08= Bath soap 09= Cocoa butter 10= No lubricant 11= Other (specify) Specify: _____ 88= Refusal 99= Don't know	_ _

	6.52 Which type of lubricant do you <u>most often</u> use for <u>anal</u> sex with men?	00= Petroleum jelly or Vaseline 01= Body creams / fatty creams 02= Water-based lubricant 03= Saliva 04= Cooking oil 05= Glycerin 06= Shea butter 07= Baby oil 08= Bath soap 09= Cocoa butter 10= No lubricant 11= Other (specify) Specify: _____ 77= N/A: Never had anal sex 88= Refusal 99= Don't know	
6.53	How difficult or easy is it for you to obtain commercial lubricants when you need them? By this I mean, are you able to buy them or obtain them for free somewhere?	00= Very difficult 01= Somewhat difficult 02= Neither difficult nor easy 03= Somewhat easy 04= Very easy 88= Refusal 99= Don't know	
6.54	In the <u>last 12 months</u> , how many times have you received services or support from a peer educator about HIV?	[Record number of times in last 12 months] 88=Refusal	
6.55	In the <u>last 12 months</u> , how many times have you participated in a support group?	[Record number of times in last 12 months] 88=Refusal	
6.56	In the <u>last 12 months</u> , how many times have you received flyers about HIV prevention or treatment?	[Record number of times in last 12 months] 88=Refusal	
6.57	In the <u>last 12 months</u> , how many times have you received mobile services for HIV testing or STI screening from TB/HIV Care Association?	[Record number of times in last 12 months] 88=Refusal	

No.	Question	Coding	Response
6.58	Where did you get information on prevention of HIV? If you received information from multiple sources, please provide the source from which you received the <u>most</u> HIV prevention information.	00= Health facility 01= Peer educator/workshop 02= Internet 03= Friends 04= Other sex workers 05= Media 06= Church 07= NGO such as THCA or SWEAT 08= Other (specify) Specify: _____ 88= Refusal	

	Now I would like to ask a few questions about drugs or substances that you may have used. Please remember, your responses are private and we will not share what you have told us with anyone else.	No (00)	Yes, in the last 12 months (01)	Yes, but not in the last 12 months (02)	Refusal (88)	
6.59	Have you <u>ever injected</u> illegal / illicit drugs?	☐	☐	☐	☐	
6.60	When using a needle to inject something (<u>for any reason</u>), did you <u>ever share</u> your used needle(s) with another person or <u>use</u> a needle that someone else had already used?	☐	☐	☐	☐	
6.61	As far as you know, have any of your sexual partners (clients or non-paying partners) used a needle to inject illicit drugs?	☐	☐	☐	☐	
6.62	Have you ever used any drug that you did <u>not</u> inject and that was <u>not</u> prescribed to you for health reasons? (Such as marijuana/dagga, whoonga, glue, cocaine, tic, or narcotics)	☐	☐	☐	☐	
"Now I would like to ask a few questions about your alcohol consumption."						
6.63	How often do you have a drink containing alcohol?	00= Never <i>[skip to 6.66]</i> 01= Monthly or less 02= Two to four times a month 03= Two to three times a week 04= Four or more times a week 88= Refusal				
6.64	How many standard drinks containing alcohol do you have on a typical day when you are drinking? By standard drink, I mean a 330 mL small can or glass of beer, a 120 mL glass of wine, or a 40 mL glass or cup of spirits or liquor.	<i>[Record the number of drinks on a typical day]</i> 88= Refusal				
6.65	How often do you have six or more standard drinks on one occasion?	00= Never 01= Less than monthly 02= Monthly 03= Weekly 04= Daily or almost daily 88= Refusal				
"Now I will ask you some questions about ways that HIV may be transmitted."						
6.66	What type of unprotected sex puts you most at risk for HIV infection? <i>[Do not read responses. Select only one.]</i>	00= Vaginal sex 01= Anal sex 02= Oral sex 03= All carry equal risk 88= Refusal 99= Don't know				

6.67	Which is the safest lubricant to use during vaginal or anal sex with latex condoms? [Do not read responses. Select only one.]	00= Petroleum jelly or Vaseline 01= Body creams / fatty creams 02= Water-based lubricant 03= Saliva 04= Cooking oil 05= Glycerin 06= Shea butter 07= Baby oil 08= Bath soap 09= Cocoa butter 10= No lubricant 11= Other (specify) Specify: _____ 88= Refusal 99= Don't know				
7.1	In what place do you <u>connect with</u> your clients to arrange sex? I will read you a list of possible places. For each one, please tell me whether you connect with clients there or not.	No (00)	Yes (01)	Refusal (88)	Don't know (99)	
	7.1a = Someone's home (including your own or someone else's) / private party	☐	☐	☐	☐	
	7.1b = Bar or club	☐	☐	☐	☐	
	7.1c = Hotel or guesthouse	☐	☐	☐	☐	
	7.1d = Brothel	☐	☐	☐	☐	
	7.1e = Street, park, forest, public garden, or public bathroom	☐	☐	☐	☐	
	7.1f = News advertisements or card	☐	☐	☐	☐	
	7.1g = Online	☐	☐	☐	☐	
	7.1h = School or work	☐	☐	☐	☐	
	7.1i = Other (specify) Specify: _____	☐	☐	☐	☐	
No.	Question	Coding				Response
7.2	Where do you <u>have sex with</u> clients? I will read you a list of possible places. For each one, please tell me whether you have sex with clients there or not.	No (00)	Yes (01)	Refusal (88)	Don't know (99)	
	7.2a = Someone's home (including yours) or private party	☐	☐	☐	☐	
	7.2b = Bar or club	☐	☐	☐	☐	
	7.2c = Hotel or guesthouse	☐	☐	☐	☐	
	7.2d = Brothel	☐	☐	☐	☐	
	7.2e = Street, park, public garden, forests or public bathrooms	☐	☐	☐	☐	
	7.2f = School or work	☐	☐	☐	☐	
	7.2g = Other (specify) Specify: _____	☐	☐	☐	☐	
7.3	In the last 12 months, on average, for every 10 clients, how many of the clients did you meet or make arrangements with via a mobile phone?	[Record number of clients 0-10] 88= Refusal				

7.4	In the <u>last 12 months</u> , how many times has a client used violence or force to make you have <u>sex without a condom</u> when you did not want or agree to it?	[Record number of times] 88= Refusal 99= Don't know				___
7.5	In the <u>last 12 months</u> , how many times has a client used violence or force to make you have <u>anal sex</u> when you did not want or agree to it?	[Record number of times] 88= Refusal 99= Don't know				___
7.6	In the <u>last 30 days</u> , how many times have you been offered more money to have sex without a condom?	[Record number of times] 88= Refusal 99= Don't know				___
	7.7 In the <u>last 30 days</u> when you have been offered more money to have sex without a condom, how many times did you accept the offer?	[Record number of times] 88= Refusal 99= Don't know				___
7.8	On average how much do you personally (not sex workers in general) get paid for:	Amount (Rand)	Not applicable (77)	Refusal (88)	Don't know (99)	Response
	7.8a = Vaginal sex with a condom?	___	☐	☐	☐	___
	7.8b = Vaginal sex without a condom?	___	☐	☐	☐	___
	7.8c = Anal sex with a condom?	___	☐	☐	☐	___
	7.8d = Anal sex without a condom?	___	☐	☐	☐	___

Module 7A—New Clients

“I’d like to ask you about your new clients. By new clients, I mean clients that you had sex with only once or twice in your life, or the first time with you had sex with a client. Your answers are completely voluntary, and you are free to skip questions if you do not feel comfortable answering them.”

No.	Question	Coding	Response
7.9	In the <u>last 30 days</u> , approximately how many new clients did you have any type of sex with (vaginal, anal, or oral)?	[Record the number of new clients. Write 00 if the answer is none and skip to 7.21] 88= Refusal 99= Don't know	___
7.10	In the <u>last 30 days</u> , have you talked with new clients about <u>the client's</u> HIV status? By this, I mean you ask or they tell you they have been tested and tell you the results, regardless of whether positive or negative.	00= No 01= With some but not all new clients 02= Yes, with all new clients (or with the only one) 88= Refusal	___
7.11	In the <u>last 30 days</u> , have you refused to have sex with any new clients because you knew or believed they are living with HIV?	00= No 01= Yes 88= Refusal 99= Don't know	___
7.12	In the <u>last 30 days</u> , have you talked with new clients about <u>your</u> HIV status? By this, I mean they ask or you tell them you have been tested and tell them the results, regardless of whether positive or negative.	00= No 01= With some but not all new clients 02= Yes, with all new clients (or with the only one) 88= Refusal	___
7.13	In the <u>last 30 days</u> , has a new client refused to have sex with you because they knew or believed that you are living with HIV?	00= No 01= Yes 88= Refusal 99= Don't know	___

No.	Question	Coding	Response
7.14	Approximately how many <u>new clients</u> did you have <u>vaginal</u> sex with in the <u>last 30 days</u> ?	[Record the number of new clients. If 00, skip to 7.16.] 88= Refusal [skip to 7.16] 99= Don't know [skip to 7.16]	[[[
	7.15 In the <u>last 10 sex vaginal acts with new clients</u> how often was a condom used when having <u>vaginal</u> sex with <u>new</u> clients?	[Record the number of acts a condom was used. Answer should be between 0-10] 88= Refusal 99= Don't know	[[[
7.16	In the <u>last 30 days</u> , approximately how many <u>new</u> clients did you have <u>anal</u> sex with?	[Record the number of new clients. If 00, skip to 7.18] 88= Refusal [skip to 7.18] 99= Don't know [skip to 7.18]	[[[
	7.17 In the <u>last 10 anal sex acts with new clients</u> how often was a condom used when having <u>anal</u> sex with <u>new</u> clients?	[Record the number of acts a condom was used. Answer should be between 0-10] 88= Refusal 99= Don't know	[[[
7.18	Now think about the <u>last time</u> you had <u>vaginal</u> sex with a <u>new</u> client. Was a condom used at that time?	00= No 01= Yes 88= Refusal 99= Don't know	[[[
7.19	Now think about the <u>last time</u> you had <u>anal</u> sex with a <u>new</u> client. Was a condom used at that time?	00= No 01= Yes 88= Refusal 99= Don't know	[[[
7.20	Now think about the last time a condom was <u>not used</u> when you had <u>vaginal or anal</u> sex with a new client. What was the <u>main reason</u> a condom was not used at that time? Do not read responses. Select only the main reason.	00= Condoms were not available 01= Did not have money to buy condoms 02= Client did not want to use 03= Client <u>offered more money</u> 04= Was raped/forced to have sex 05= Was afraid of being beaten if insisted to use condom 06= I don't like using condoms 07= I was using another birth control method 08= Did not believe the client had HIV 09= Other (specify) Specify: _____ 77= Never had sex with new client without condom 88= Refusal 99= Don't know	[[[

Module 7B—Regular Clients/Regular Paying Partners

“Next I am going to ask you about your regular clients. Regular clients are those whom you have had sex with at least three times in your life and who have paid you for sex.”

No.	Question	Coding	Response
7.21	In the <u>last 30 days</u> , approximately how many different <u>regular</u> clients have you had <u>any type</u> of sex with (including oral, vaginal, or anal sex)?	[Record the number of new clients. Write 00 if the answer is none and skip to 7.33] 88= Refusal 99= Don't know	[[[

No.	Question	Coding	Response
7.22	In the <u>last 30 days</u> , have you talked with your <u>regular clients</u> about <u>the client's</u> HIV status? By this, I mean you ask or they tell you they have been tested and tell you the results, regardless of whether positive or negative.	00= No 01= With some but not all regular clients 02= Yes, with all regular clients (or with the only one) 88= Refusal	
7.23	In the <u>last 30 days</u> , have you refused to have sex with any regular clients because you knew or believed they are living with HIV?	00= No 01= Yes 88= Refusal 99= Don't know	
7.24	In the <u>last 30 days</u> , have you talked with any <u>regular</u> clients about <u>your</u> HIV status? By this, I mean they ask or you tell them you have been tested and tell them the results, regardless of whether positive or negative.	00= No 01= With some but not all regular clients 02= Yes, with all regular clients (or with the only one) 88= Refusal	
7.25	In the <u>last 30 days</u> , has a <u>regular client</u> refused to have sex with you because they knew or believed they you are living with HIV?	00= No 01= Yes 88= Refusal 99= Don't know	
7.26	Approximately how many times did you have <u>vaginal sex</u> with <u>regular clients</u> in the <u>last 30 days</u> ?	<i>[Record the number of sex acts. If 00, skip to 7.28.]</i> 88= Refusal <i>[skip to 7.28]</i> 99= Don't know <i>[skip to 7.28]</i>	
	7.27 In the <u>last 10 vaginal sex acts with regular clients</u> how often was a condom used when having <u>vaginal</u> sex?	<i>[Record the number of acts a condom was used. Answer should be between 0-10]</i> 88= Refusal 99= Don't know	
7.28	Approximately how many times did you have <u>anal sex</u> with <u>regular clients</u> in the <u>last 30 days</u> ?	<i>[Record the number of sex acts. If 00, skip to 7.30]</i> 88= Refusal <i>[skip to 7.30]</i> 99= Don't know <i>[skip to 7.30]</i>	
	7.29 In the <u>last 10 anal sex acts with regular clients</u> how often was a condom used when having <u>anal</u> sex with <u>regular</u> clients?	<i>[Record the number of acts a condom was used. Answer should be between 0-10]</i> 88= Refusal 99= Don't know	
7.30	Now think about the <u>last time</u> you had <u>vaginal</u> sex with a <u>regular client</u> . Was a condom used at that time?	00= No 01= Yes 88= Refusal 99= Don't know	
7.31	Now think about the <u>last time</u> you had <u>anal</u> sex with a <u>regular client</u> . Was a condom used at that time?	00= No 01= Yes 77= NA, no anal sex with regular client 88= Refusal 99= Don't know	

No.	Question	Coding	Response
7.32	Now think about the <u>last time</u> a <u>condom was not used</u> when you had <u>vaginal or anal</u> sex with a <u>regular client</u>. What was the <u>main reason</u> a condom was not used at that time? [Do not read responses. Select only the main reason.]	00= Condoms were not available 01= Did not have money to buy condoms 02= Client did not want to use 03= Client <u>offered more money</u> 04= Was raped/forced to have sex 05= Was afraid of being beaten if insisted to use condom 06= I don't like using condoms 07= I was using another birth control method 08= Did not believe the client had HIV 09= Other (specify) Specify: _____ 77= Never had sex with regular client without condom 88= Refusal 99= Don't Know	

Module 7C--Non-paying partners

“Next I am going to ask you about your non-paying partners. Non-paying partners are those who you have sex with, but are not your clients and therefore do not pay you for sex. This may include partners you live with, boyfriends or girlfriends (who do not pay you) and husbands. This would also include partners you have sex with for pleasure, without any sort of payment.”

No.	Question	Coding	Response
7.33	In the <u>last 30 days</u> , approximately how many different <u>non-paying partners</u> have you had <u>any type</u> of sex with (including oral, vaginal, or anal sex)?	<i>[Record the number of new clients. Write 00 if the answer is none and skip to 7.40]</i> 88= Refusal 99= Don't know	
7.34	Out of your <u>non-paying partners</u> in the last 30 days (<i>the number from question 7.33</i>), how many of these would you consider main partners? By this I mean a husband, boyfriend, or girlfriend you feel committed to.	<i>[Record the number of partners]</i> 88= Refusal	
7.35	What gender(s) are your <u>non-paying</u> partners?	00= Men only 01= Women only 02= Both men and women 03= Transgender women 04= Transgender men 88= Refusal	
7.36	In the <u>last month</u> , have you talked with <u>non-paying</u> partners about <u>the partner's</u> HIV status? By this, I mean you ask or they tell you they have been tested and tell you the results, regardless of whether positive or negative.	00= No 01= With some but not all non-paying partners 02= Yes, with all non-paying partners (or with the only one) 88= Refusal	
7.37	In the <u>last 30 days</u> , have you refused to have sex with a <u>non-paying partner</u> because you knew or believed they were living with HIV?	00= No 01= Yes 88= Refusal 99= Don't know	
7.38	In the <u>last 30 days</u> , have you talked with <u>non-paying</u> partners about <u>your</u> HIV status? By this, I mean they ask or you tell them you have been tested and tell them the results, regardless of whether positive or negative.	00= No 01= With some but not all non-paying partners 02= Yes, with all non-paying partners (or with the only one) 88= Refusal	

No.	Question	Coding	Response
7.39	In the <u>last 30 days</u> , has a <u>non-paying partner</u> refused to have sex with you because they knew or believed they you are living with HIV?	00= No 01= Yes 88= Refusal 99= Don't know	[[[
7.40	In the <u>past 12 months</u> , how many long-term partners have you had? These are partners who you are or were in a relationship with.	[Record the total number of long-term partners. If 00, skip to 7.48] 88= Refusal 99= Don't know	[[[
	7.41 Concerning the long-term partners you have had in the past 12 months, how long have you been together with the partner(s) (or how long were you with this partner before you split up)?	[Record the total number of months with each partner. If answer is in yrs multiply by 12] Long-term partner 1 Long-term partner 2 Long-term partner 3 Refusal=88	[[[[[[[[[
7.42	Approximately how many times did you have <u>vaginal sex</u> with a <u>long-term partner</u> in the <u>last 30 days</u> ?	[Record the number of sex acts. If 00, skip to 7.44] 88= Refusal [skip to 7.44] 99= Don't know [skip to 7.44]	[[[
	7.43 In the <u>last 10 vaginal sex acts with long-term partners</u> how often was a condom used when having <u>vaginal sex</u> with <u>long-term partner(s)</u> ?	[Record the number of acts a condom was used. Answer should be between 0-10] 88= Refusal 99= Don't know	[[[
7.44	Approximately how many times did you have <u>anal sex</u> with a <u>long-term partner</u> in the <u>last 30 days</u> ?	[Record the number of sex acts. If 00, skip to 7.46] 88= Refusal [skip to 7.46] 99= Don't know [skip to 7.46]	[[[
	7.45 In the <u>last 10 anal sex acts with long-term partners</u> how often was a condom used when having <u>anal sex</u> with <u>long-term partner(s)</u> ?	[Record the number of acts a condom was used. Answer should be between 0-10] 88= Refusal 99= Don't know	[[[
7.46	Now think about the <u>last time</u> you had <u>vaginal sex</u> with a <u>long-term partner</u> . Was a condom used at that time?	00= No 01= Yes 88= Refusal 99= Don't know	[[[
7.47	Now think about the <u>last time</u> you had <u>anal sex</u> with a <u>long-term partner</u> . Was a condom used at that time?	00= No 01= Yes 77= NA, never had anal sex with long-term partner 88= Refusal 99= Don't know	[[[
7.48	In the past year, how many casual non-paying partners have you had? These are partners who you are not committed to, but have had sex with once or more frequently.	[Record the total number of casual partners. If 0 skip to Module 8 on page 36] 88= Refusal 99= Don't know	[[[
	7.49 Concerning the casual non-paying partners you have had in the past year, <u>how many times</u> have you had vaginal or anal sex with the casual partners in the past year?	[Record the total number of times had sex with a casual partner] 88= Refusal	[[[

No.	Question	Coding	Response
7.50	Approximately how many times did you have <u>vaginal sex</u> with a <u>casual non-paying partner</u> in the <u>last 30 days</u> ?	<i>[Record the number of sex acts. If 00, skip to 7.52]</i> 88= Refusal <i>[skip to 7.52]</i> 99= Don't know <i>[skip to 7.52]</i>	
	7.51 In the last 10 vaginal sex acts with casual partners how often was a condom used when having <u>vaginal</u> sex with <u>casual non-paying partner(s)</u> ?	<i>[Record the number of acts a condom was used. Answer should be between 0-10]</i> 88= Refusal 99= Don't know	
7.52	Approximately how many times did you have <u>anal sex</u> with a <u>casual non-paying partner</u> in the <u>last 30 days</u> ?	<i>[Record the number of sex acts. If 00, skip to 7.54]</i> 88= Refusal <i>[skip to 7.54]</i> 99= Don't know <i>[skip to 7.54]</i>	
	7.53 In the last 10 anal sex acts with casual partners how often was a condom used when having <u>anal</u> sex with <u>casual non-paying partner(s)</u> ?	<i>[Record the number of acts a condom was used. Answer should be between 0-10]</i> 88= Refusal 99= Don't know	
7.54	Now think about the <u>last time</u> you had <u>vaginal</u> sex with a <u>casual non-paying partner</u> . Was a condom used at that time?	00= No 01= Yes 88= Refusal 99= Don't know	
7.55	Now think about the <u>last time</u> you had <u>anal</u> sex with a <u>casual non-paying partner</u> . Was a condom used at that time?	00= No 01= Yes 77= NA, never had anal sex with casual partner 88= Refusal 99= Don't know	
7.56	Now think about the <u>last time</u> a condom was <u>not used</u> when you had <u>vaginal or anal</u> sex with a <u>non-paying partner</u> . What was the <u>main reason</u> a condom was not used at that time? <i>Do not read responses. Select only the main reason.</i>	00= Condoms were not available 01= Did not have money to buy condoms 02= Partner did not want to use 03= Was raped/forced to have sex 04= Was afraid of being beaten if insisted to use condom 05= I don't like using condoms 06= I was using another birth control method 07= Did not believe partner had HIV 08= Condom burst 09= Other (specify) Specify: _____ 77= Never had sex with non-paying partner without condom 88= Refusal 99= Don't Know	

Module 8--Depression

“Now I am going to ask about your feelings of sadness or depression. I will read you a list of the ways you may have felt or behaved. Please tell me how often you have felt this way during the past TWO WEEKS. Please do not feel bad about answering as we will not tell anyone about what you will tell us. Your answers are completely voluntary, and you are free to skip questions if you do not feel comfortable answering them.”

No.	Question	Coding					Response
8.1	Over the last 2 weeks, how often have you been bothered by any of the following problems? [READ RESPONSES ALOUD]	Not at all (00)	Several days (01)	More than half the days (02)	Nearly every day (03)	Refusal (88)	
8.1a	Little interest or pleasure in doing things	☐	☐	☐	☐	☐	___
8.1b	Feeling down, depressed (sad), or hopeless	☐	☐	☐	☐	☐	___
8.1c	Either trouble falling or staying asleep, OR sleeping too much	☐	☐	☐	☐	☐	___
8.1d	Feeling tired or having little energy	☐	☐	☐	☐	☐	___
8.1e	Either poor appetite OR overeating	☐	☐	☐	☐	☐	___
8.1f	Feeling bad about yourself –or that you are a failure or have let yourself or your family down	☐	☐	☐	☐	☐	___
8.1g	Trouble concentrating on things, such as reading the newspaper or watching TV	☐	☐	☐	☐	☐	___
8.1h	Either moving or speaking so slowly that other people could have noticed OR being so fidgety or restless that you have been moving around a lot more than usual	☐	☐	☐	☐	☐	___
8.1i	Thoughts that you would be better off dead, or hurting yourself in some way	☐	☐	☐	☐	☐	___
[If the participant answered not at all, don't know, or refusal to all the above questions in module 8, skip to module 9]							
	8.2 If you are having any of the problems above, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?	00= Not difficult at all 01= Somewhat difficult 02= Very difficult 03= Extremely difficult 88= Refusal					___

Module 9--Discussing Condom Use

"I'm going to ask you several questions about using condoms and how difficult you may find it to discuss or encourage condom use in different circumstances. For each situation, you can tell me if you find it very difficult, somewhat difficult, neither difficult nor easy, somewhat easy, or very easy. Your answers are completely voluntary, and you are free to skip questions if you do not feel comfortable answering them."

No.	Question	Coding	Response
9.1	In general, how difficult or easy is it for you to use or suggest using a condom with a <u>new</u> client?	00= Very difficult 01= Somewhat difficult 02= Neither difficult nor easy 03= Somewhat easy 04= Very easy 77= Not applicable: no new clients 88= Refusal 99= Don't know	___

9.2	In general, how difficult or easy is it for you to use or suggest using a condom with a <u>regular</u> client?	00= Very difficult 01= Somewhat difficult 02= Neither difficult nor easy 03= Somewhat easy 04= Very easy 77= Not applicable: no regular clients 88= Refusal 99= Don't know	
9.3	In general, how difficult or easy is it for you to use or suggest using a condom with a <u>non-paying</u> partner?	00= Very difficult 01= Somewhat difficult 02= Neither difficult nor easy 03= Somewhat easy 04= Very easy 77= Not applicable: no non-paying partners 88= Refusal 99= Don't know	
9.4	How old were you when you <u>first</u> started using condoms?	[Record age in years] 88= Refusal 99= Don't know	
9.5	How old were you, if ever, when you started using condoms <u>consistently</u> or during most of your sex acts?	[Record age in years] 77= Not applicable 88= Refusal 99= Don't know	

To be completed by interviewer:

No.	Question	Coding	Response
10.1	Questionnaire language?	00= English 01= Xhosa 02= Both	
10.2	How well do you know the participant?	00= Not at all 01= By name only 02= Quite well 03= Very well	

To be completed by coupon manager:

No.	Question	Coding	Response
10.3	How many coupons were given to the participant?	[Note the number of coupons] 00 01 02 03	
10.4	Coupon Manager: [Note the number of each individual coupon.]		
	10.4a Outcoupon 1	_____	
	10.4b Outcoupon 2	_____	
	10.4c Outcoupon 3	_____	

