The HIV cascade of care and service utilisation at sex work programmes among female sex workers in South Africa

Research Report for Master's in Public Health

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Declaration

I, Maya Jaffer, student number 1922750, declare that this research report is my original work. It is submitted in partial fulfilment of the requirements for the degree of Master of Public Health, in the field of Health Systems and Policy, at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination to this or any other university.

I have read the sections on referencing and plagiarism in the WITS Plagiarism Policy. I am aware that the plagiarism is wrong and that the University of the Witwatersrand may take disciplinary action should plagiarism be found in this work. I have followed the required conventions in referencing the thoughts and ideas of others. I confirm that all of the work submitted in this thesis is my own unaided work except where I have explicitly indicated otherwise.

Signed: 

Date: 16th September 2021

Preface

This research report is submitted for examination for a Master's in Public Health degree. It is prepared according to the University of the Witwatersrand School of Public Health guidelines for research reports in submissible format. The report includes a manuscript drafted for submission to the Journal of Acquired Immune Deficiency Syndrome (JAIDS) (see Appendix 2 for author guidelines).

Material included in the drafted manuscript and this research report was presented in poster format at the International Aids Society's annual conference between the 2nd to 6th July 2020. The citation for this presentation is as follows:

Jaffer M, Hunt G, Hlongwane K, Milovanovic M, Otwombe K, Matuludi M, et al. A national survey of HIV prevalence, continuum of care and HIV drug resistance amongst female sex workers in South Africa. Poster presented at: 22nd International AIDS Conference (AIDS 2020), 6-10 July 2020.

Abstract

Introduction

Female sex workers (FSWs) in South Africa experience uniquely high prevalence of HIV. There are multiple barriers to FSWs accessing HIV testing and treatment services, including the effects of stigma on health-seeking behaviour. It is well-established that engagement with HIV services is improved in the setting of a sex worker friendly programme. Therefore, National Department of Health (NDoH) has scaled-up specialised programmes to provide HIV services through the implementation of the National Sex Work HIV Plan 2016-2019, with the aim of reaching the 90:90:90 cascade of care (CoC) goals. This study aimed to describe the current CoC in FSWs in South Africa, and explore the impact on service use at these sex work programmes on this CoC.

Methodology

The primary study was a cross-sectional national study, that collected survey and laboratory data from FSWs in all nine provinces of South Africa, from February – July 2019. This secondary analysis considered all 1862 participants with HIV in this study. New variables were created to describe the HIV CoC with respect to known positivity, current antiretroviral treatment (ART) and viral suppression. A multivariable regression model assessed factors associated with successful viral suppression, including sex work programme service use variables.

Results

1862 FSWs with HIV were enrolled. 92% (1708/1862) were known HIV positive, and 87% (1453/1673) of these currently on antiretroviral treatment (ART). Of those on ART, 74% (1024/1385) were virally suppressed. Age was strongly associated with the CoC, with younger FSWs less likely to be on ART or virally suppressed ($p<0.001$). FSWs using HIV services from specialised programmes were 1.4 times more likely to be virally suppressed (95% CI: 1.1 – 1.9, $p=0.012$) than those not.

Conclusions

The HIV CoC in FSWs in South Africa is high, with marked improvement from previous estimates, prior to the implementation of the National Sex Work HIV Plan 2016-2019. Known positivity and current ART treatment effectively reach 90:90:90 goals, though viral suppression lags significantly behind. The findings affirm the work of sex work programmes, with the use of HIV services from these programmes improving the odds of viral suppression in the multivariable regression model. Further attention needs to be paid to the poorer CoC outcomes in younger FSWs, who are less likely to be on ART or virally suppressed.

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Thanks to the SW-SIB core team (who designed and ran the primary study), especially Minja Milovanovic, Khuthadzo Hlongwane, Kennedy Otwombe, Mokgadi Matuludi, and Venice Mbowane, for their contribution to the research and encouragement as colleagues. Special thanks also to Rachel Jewkes for her generous and helpful comments during the drafting of the manuscript.

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List of abbreviations

ART	Antiretroviral treatment
ARV	Antiretroviral drug
CoC	Cascade of care
FSW	Female sex worker
HCW	Health care worker
HIV	Human immunodeficiency virus
HREC	Human Research Ethics Committee
IBBS	Integrated bio-behavioural survey
ICF	Informed consent form
LTFU	Loss to follow-up
NDoH	National Department of Health
NGO	Non-governmental organisation
NHLS	National Health Laboratory Service
NICD	National Institute of Communicable Diseases
PHRU	Perinatal HIV Research Unit
PLHIV	People living with HIV
PMTCT	Prevention of mother-to-child transmission of HIV
PrEP	Pre-exposure prophylaxis for HIV
STI	Sexually transmitted infection
SW	Sex worker
TB	Tuberculosis
UTT	Universal test & treat
VL	Viral load
WHO	World Health Organization

1 Introduction

1.1 Background

Female sex workers (FSWs) in South Africa are uniquely affected by HIV infection, with extremely high prevalence reported in the range of 40-70% in the major cities of the country.[1,2] The criminalisation of sex work and a social environment that stigmatises sex workers (SWs) increases vulnerability to human rights abuses and ill-health,[3,4] and sex work has been shown to be directly associated with greater HIV risk.[5] The exact number of FSWs in South Africa is not known, but population size estimates place FSWs at around 0.5 – 1% of the total adult female population.[2,6]

In recent years the National Department of Health (NDoH) has focused greater attention on HIV in SWs, partly through the implementation of a National Sex Worker HIV Plan 2016-2019.[7] The plan involved scaling up of specialised sex work programmes and clinics, which provided SW friendly health services across the country, to improve access to HIV prevention and care.[7] A key driver of these programmes was the implementation of oral pre-exposure prophylaxis (PrEP) to prevent HIV, as SWs were earmarked by the NDoH as among the first key populations to receive PrEP in the general roll-out in South Africa. However, in addition to this, the plan advocated for the delivery of a comprehensive set of services to SWs, including universal test and treat (UTT) approaches to HIV care, other sexual and reproductive health services, psychosocial and legal support, and economic empowerment.[7]

These programmes were typically run by non-governmental organisations (NGOs) working in partnership with the NDoH, some of which had already been active prior to the implementation of the plan, while others were new to implementing SW services. At the start of 2019, after three years of implementation of the plan, 22 out of 52 districts in South Africa had dedicated active sex worker programmes.[8] There was some variability with respect to the exact service package available at each site, but all directed considerable focus towards HIV testing and treatment. This was driven by the National Sex Worker HIV Plan commitment to the achievement of World Health Organization (WHO) defined 90:90:90 goals, which require 90% of the population of SWs with HIV to know their status, 90% of these to be on antiretroviral treatment (ART) and 90% of these to be virally suppressed.[7] A successful cascade of care (CoC) to reach these goals includes multiple elements: HIV testing and diagnosis, treatment with antiretroviral drugs (ARVs), and adherence support to achieve viral suppression.

There is limited published literature exploring the actual utilisation of these sex work programmes in South Africa, or on the success of the National Sex Worker HIV Plan. A recently completed national study conducted in 2019 entitled 'Modelling HIV & Associated Factors amongst Sex Workers in South Africa' (see Appendix 3 – Ethics approval 180809), collected survey and laboratory data from FSWs who have access to various sex work programme services across the country.[8] The primary study used an operational definition of SWs as including those who exchange sex for money or goods as their primary source of income. The study focused on female sex workers as funding was available for research on HIV in adolescent girls and young women, and thus did not collect data on male or transgender sex workers. This provided an opportunity to assess the current status of the HIV CoC in FSWs in South Africa and explore potential impacts of sex work programmes on this CoC.

1.2 Literature review

1.2.1 HIV prevalence and sex work in South Africa

HIV and sex work has long been a major public health concern in South Africa. A large integrated bio-behavioural survey (IBBS) from 2013-2014 collected data from FSWs in the three major cities in the country and showed prevalence ranging from 40% in Cape Town, 54% in Durban and 72% in Johannesburg.[1] The variability of HIV prevalence across the cities suggests that localised factors clearly impact HIV risk, further demonstrated by a survey of FSWs working along a major trucking route in the country showing a shocking 90% prevalence of HIV in this subgroup of the population.[9] Experts have emphasised that multiple factors, including, for example, geographic location, the "type" of sex work practiced, and exposure to sexual violence, likely affect the risk profile of an individual SW.[3] At a structural level however, it is likely that the criminalised status of sex work in South Africa contributes to a general increase in HIV risk, with recent research suggesting that criminalisation is associated with an eight-fold increase in the risk of prevalent HIV infection compared to settings with partial legalisation.[4] In summary, it is clear that FSWs represent a key and vulnerable population in the fight against HIV in South Africa, with all estimates demonstrating far greater prevalence than what is seen in the general population.

1.2.2 HIV testing among sex workers

Challenges with respect to providing HIV testing services in SW populations are myriad and extremely well-documented, with a recent systematic literature review finding the two most frequently reported barriers to HIV testing were the effects of stigma and discrimination on SW health-seeking behaviour, and financial and time-based costs to testing.[10] SWs are vulnerable to

the dual effects of HIV-related stigma and sex work-related stigma, and also experience both external and internal (self-directed) stigma.[11] Multiple studies around the world have demonstrated a link between reported experiences of stigma among FSWs and lower willingness to engage in health services.[12–14] A study from Kenya showed that at least half of FSWs reported experiences of verbal discrimination from health care workers (HCWs).[12] Qualitative research has repeatedly shown that fear of discrimination and abuse by HCWs, receiving poorer quality services as a result of being a SW, and breaches of confidentiality with respect to their identity as a SW all play a huge role in deterring SWs from accessing HIV and other health services.[15–18] Financial and time-based costs to testing are experienced as long distances from testing facilities and time required to receive a test, particularly in the context in which this in which time spent may translate into lost income.[15,19]

Sociodemographic factors are also determinants of HIV testing in FSWs, with young FSWs representing a key risk group. Older age at entry into sex work has been associated positively with previous HIV testing in Iran,[20] and a large, recent pooled analysis of studies across nine African countries showed young FSWs with HIV were both less likely to have previously tested for HIV and less likely to be aware of their HIV positive status.[21] Cross-border migrant SWs in South Africa have also been associated with substantially lower rates of contact with health care facilities and service utilisation.[22]

Conversely, research has highlighted several facilitators for HIV testing among SWs, including providing services through specialised programmes (to be discussed later in section 1.2.4.). Social networks have been repeatedly shown to play a large role in supporting testing,[10] with knowledge of other people living with HIV (PLHIV) being associated with a recent HIV test in FSWs from Russia,[19] and in a Zimbabwean study FSWs who had received encouragement to test from peers were two and a half times more likely to know their HIV positive status.[23] HIV risk assessment and the perceived benefits of testing are additional determinants of HIV testing in individual SWs, with one study showing self-perceived HIV risk increased the odds of HIV testing by more than eight times,[20] and qualitative findings suggest being able to access HIV treatment is experienced as a motivator for treatment.[19] However, researchers have also noted that certain risk reduction practices (e.g. condom usage) may be determined by client rather than SW preference, and so the perceived and actual benefits of HIV testing for SWs may be reduced compared to the general population.[24] Finally, multiple studies have suggested that reproductive health concerns among FSWs may facilitate HIV testing, particularly when access to reproductive health services such as the provision of family planning or antenatal care is linked to HIV testing.[15,25,26]

In South Africa, the evidence on the uptake of HIV testing among FSWs has been somewhat encouraging, with the 2013-2014 IBBS survey showing more than 90% of FSWs had at least one previous HIV test.[1] However, known positivity in this survey did not yet achieve 90:90:90 goals, with the proportion of FSWs with HIV knowing their status ranging between 57-78% across the sites.[1] Both a 2015 study from Port Elizabeth and a 2016 study in Soweto showed better results, in both instances 82% of FSWs with HIV reporting prior knowledge of their status.[27,28] These studies all pre-date the formal implementation of the National Sex Work HIV Plan and the introduction of PrEP services, which require frequent HIV testing and also influence the perceived benefits of testing. Additionally, evidence points to the high acceptability of HIV self-testing in FSWs in the region,[29] but self-testing remains in the early stages of implementation in South Africa and has not been widely available up until now.

1.2.3 Antiretroviral treatment in sex workers

Akin to the factors impacting uptake of HIV testing, SWs face considerable challenges with respect to uptake of HIV treatment. Sex work is an independent risk factor for poor HIV treatment outcomes, with global studies among the general population of PLHIV have shown that being a SW is associated with lower likelihood of initiating ART and of being non-adherent to ART.[30,31] A systematic review of research into HIV care among FSWs in Africa concluded that HIV treatment outcomes are inferior in this population,[32] and evidence from South Africa has previously suggested that the highest losses in the HIV CoC in FSWs take place at initiation of ART.[27]

Qualitative research from the region again highlights the role that discriminatory experiences at health facilities act as deterrents to accessing HIV care, as well as the particular risk of being identified as a SW if linkage to care at a general facility has to be facilitated by a known SW programme.[33] Similar concerns regarding loss of productive and income-generating hours have also been highlighted in multiple studies of barriers to uptake of HIV treatment in FSWs.[33,34] Non-disclosure of an HIV positive status to a non-paying partner has also been associated with lower uptake of ART.[27]

Successful HIV care requires not just initiation of ART but also retention in care to achieve viral suppression. Again, SWs face several unique challenges to remaining in care over the long-term. Evidence from the Dominican Republic has shown that ART treatment interruptions in FSWs were very frequent, and were associated with both experiences of discrimination and internalised stigma.[35] A retrospective cohort study in Côte d'Ivoire showed that the absence of adherence counselling at initiation of treatment was associated with loss to follow-up (LTFU)

over time.[36] Qualitative research has highlighted the mobility of SWs as a specific challenge to retention on treatment, with SWs reporting struggles with maintaining access to ART when required to travel frequently for work.[16] Finally, a systematic review has found that the prevalence of food and financial insecurity and concurrent alcohol and substance use have all been linked to challenges in FSWs long-term adherence to ART medication.[32]

Pooled estimates from Southern, Central and West Africa also affirm again that young FSWs are significantly less likely to report engagement in HIV care and current ART use,[21] and evidence from Zimbabwe has shown young FSWs were less likely to be virally suppressed than their older counterparts.[23]

Despite all these challenges, a 2014 global meta-analysis of quantitative studies on the HIV cascade of care in FSWs suggested that FSWs could in fact reach levels of ART uptake, retention and viral suppression comparable to those seen in the general population at the time.[37] The pooled estimates generated from the data showed 38% of FSWs with HIV were currently on ART, 75% of those on treatment were appropriately adherent to medication, and 57% were virally suppressed.[37] In line with these findings, in South Africa the 2013-2014 IBBS survey in the major cities showed 23-45% of FSWs with HIV were currently taking ART.[1] Similarly, FSWs with HIV in the 2015 study in Port Elizabeth and the 2016 study in Soweto reported ART coverage of 39% and 44% respectively.[27,28] It must be noted that these studies were from prior to revisions of HIV policy in South Africa, with the UTT approach adopted in late 2016, meaning at the time ART was only initiated at CD4 counts of less than 500.

1.2.4 HIV care within specialised sex work programmes

Evidence globally and locally strongly suggests that engagement with health and HIV services is improved in the setting of a specialised sex work programme as opposed to a health facility geared towards the general population. FSWs in Brazil have been found to be more likely to disclose their HIV status to a HCW if they belong to a non-governmental organisation or programme.[13] Additionally, sex work clinics tend to involve peer-led or implemented interventions, in which former or current SWs plan and deliver health services for their own community. Broadly-speaking, peer-led approaches emphasise the benefits of local knowledge in SW communities to addressing barriers to care, and include community empowerment processes that lead to improved health outcomes.[38] Quantitative studies from India and Zimbabwe have shown peer encouragement and peer-led outreach activities are significantly associated with earlier and increased uptake of HIV testing services.[23,39] Qualitative research has also suggested

the mobilisation of peer networks is a key facilitator in attracting SWs to HIV care.[15] This evidence informed South Africa's National Sex Worker HIV Plan, which emphasises a peer-led approach.[7]

Qualitative research from South Africa and neighbouring countries also supports these conclusions, with FSWs citing a preference for SW specific clinics, in which solidarity with peers and interactions with more sympathetic and sensitised staff are strong motivating factors in engaging with clinic activities.[18,34,40,41] Other logistical factors also play a role in making specialised sex work clinics more attractive to the community, including that they may operate at times and areas more accessible for SWs, for example after-hours or over the weekend, and via mobile services close to sex work hotspots.[40–42]

However, the ideal model for service provision of HIV services to SWs remains undetermined, and the exact strengths and weakness of current approaches are not yet fully understood. For example, a recent cluster randomised trial in Zimbabwe tested the effects of expanded HIV prevention and treatment services at sex work clinics – among other features this included community mobilisation, intensive adherence support, and enhanced clinic initiation of PrEP and ART. While the evidence showed improved rates of testing and diagnosis in the intervention arm, in fact there was no significant difference between viral suppression between the control and intervention arms.[43] It must also be noted that the intervention arm in this study had several similarities to the approach set out in South Africa's Sex Worker HIV Plan.

Additionally, there are significant competing priorities for the kinds of health services that SW clinics and programmes could implement. Mental health issues and violence exposure have been shown to be devastatingly prevalent among FSW populations in South Africa and warrant serious concern and intervention.[44] Local research has shown more than 70% of FSWs have had experiences of physical or sexual violence within the preceding year, suggesting an urgent need for post-violence care.[45] The National Sex Worker HIV Plan recognises the role that drivers such as gender-based violence play in the HIV epidemic and advocates for a comprehensive package of services, including psychosocial interventions.[7] However, in the complex funding environment programmes operate in, direct HIV services typically form the backbone of interventions, with psychosocial services subsidiary to this. In summary, it is not clear how the mix of services available to key populations like FSWs impacts HIV CoC outcomes. Experts have highlighted the need for further research into innovative and efficacious HIV programming in SWs.[43]

1.3 Problem statement

In recent years, the NDoH in South Africa has focused attention on the key populations with the greatest vulnerability to HIV. Sex work programmes and clinics have been implemented across the country providing enhanced HIV prevention and treatment services, with 2016 seeing the addition of PrEP and ART provision.[7] There is limited literature describing the current utilisation of these and other health services at a national scale. There is also a need for up-to-date data on the current HIV CoC in FSWs to assist in guiding HIV programming.

1.4 Justification

Understanding the current utilisation of health services at sex work clinics in South Africa is critical to guiding further HIV-related policy and implementation in this key population. The research data used in this report is from a national study modelling HIV in FSWs, and it provides data from both FSWs accessing sex work programmes and those who are not accessing services through these programmes, allowing for further comparison between groups.[8] Furthermore, understanding specifically the impact of utilisation of these services on the various elements of the HIV CoC may assist in exploring the current strengths and weaknesses of sex work clinics in addressing these gaps.

1.5 Research question

The guiding research question for this study is: what is the HIV CoC among FSWs in South Africa, and what is the relationship between the CoC and utilisation of HIV services at sex work programmes?

1.6 Aim

To describe the current HIV CoC and service utilisation at sex work programmes among FSWs in South Africa and determine if service utilisation has any effect on the CoC.

1.7 Objectives

1. Describe the current HIV CoC in FSWs in South Africa.
2. Describe service utilisation of sex work programmes by FSWs in South Africa during 2019.
3. Determine factors associated with successful viral suppression, including any service utilisation at sex work programmes.

2 Methodology

2.1 Introduction

The primary study was a national survey of FSWs, entitled 'Modelling HIV & Associated Factors amongst Sex Workers in South Africa'.[8] It collected survey and laboratory data from FSWs between February to July 2019. This research report focuses on a secondary analysis of the data collected in this study and investigates the HIV CoC and associations with programme service usage by FSWs in the study sample.

2.2 Primary study

2.2.1 Study design

The primary study was a cross-sectional survey of FSWs across South Africa in 2019.

2.2.2 Study sites

The primary study included at least one study site in each of South Africa's nine provinces. The study was coordinated centrally by a team based at the Perinatal HIV Research Unit (PHRU), but the sites were operated by partner organisations running local sex work programmes. These organisations were all implementing programmes broadly in line with the National Sex Worker HIV Plan, although they did not provide the exact same set of services, and one site (in the Northern Cape) was a pilot programme with only peer-based services available.

2.2.3 Study population

The primary study population were biologically female, ≧18 years of age, and had sold sex in the preceding 6 months in their enrolment district - migration status was not an exclusion criterion.

2.2.4 Sampling

The sampling strategy involved chain referral or snowball sampling, but also included elements of random sampling to increase representivity in the sample. Sampling took place as follows:

1. A stratified random sample of 12 districts was drawn from the 22 districts in the country that had active sex work programmes operating in them at the time (ensuring ≧ one district per province). In each randomly selected district, a partner organisation running a local sex work programme was chosen to implement the study.
2. The required sample size from each of the 12 districts was weighted according to a previous FSW population size estimated performed in South Africa in 2013.[6] First, the provincial FSW population estimate was used to weight the desired sample size for each province, out of a total of 3000 participants. The desired sample size from each district

was then determined according to the relative sizes of the districts. See Table 1 below for the final list of randomly sampled districts, the weighting according to the previous population size estimate, the target sample size from each province, the weighting according to the relative size of each district, and the target sample size per site.

3. Each partner organisation mapped the known sex work hotspots in the selected district, which were then stratified according to type of hotspot (e.g. brothel, hotel, tavern, truck-stop, private house). A stratified random selection of hotspots was drawn from each district ensuring representation of multiple hotspot types.
4. Seed coupons (i.e. a voucher enabling screening and possible enrolment into the study) were distributed at each selected hotspot and using a chain referral method every participant enrolled into the study was given three coupons and asked to distribute these at random to fellow FSWs that they knew, and who met the inclusion criteria.

Table 1: Randomly sampled districts with required and final sample sizes

Province	Districts	SW population size estimate	Proportion of SW population in province	Target sample size per province	Proportion of SW population in district	Target sample size per site
Gauteng	City of Johannesburg Metro	32824	28.5%	854	62%	528
	Ekurhuleni Metro				20%	167
	City of Tshwane Metro				18%	159
KwaZulu-Natal	eThekwini Metro	16797	14.6%	437	82%	357
	Ugu District				18%	80
Western Cape	City of Cape Town Metro	14529	12.6%	378	100%	378
North West	Bojanala District	10 685	9.3%	278	100%	278
Mpumalanga	Ehlanzeni District	10 224	8.9%	266	100%	266
Eastern Cape	Buffalo City Metro	9 917	8.6%	258	100%	258
Limpopo	Vhembe District	9 686	8.4%	252	100%	252
Free State	Thabo Mofutsanyana District	7 264	6.3%	189	100%	189
Northern Cape	Frances Baard District	3 382	2.9%	88	100%	88
Total		**115308**	**100%**	**3000**	**N/A**	**3000**

2.2.5 Data collection

Data collection for the primary study took place from February to July 2019 and enrolled a total sample of 3144 FSWs across South Africa. After exclusions due to discrepancies related to a

technical malfunction and due to a data collection concern at one site, a total analysable sample of 3005 FSWs was achieved.

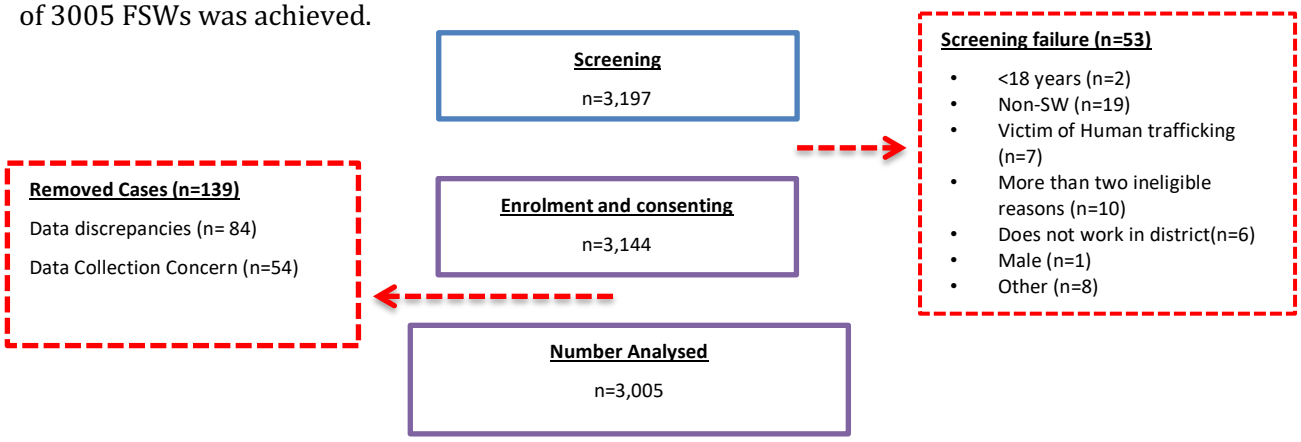

Figure 1: Disposition chart showing numbers screened, enrolled and analysed

Data collection at each site was implemented by a team comprising of a study nurse and two peer interviewers (i.e. peer SWs who were upskilled to ensure reliable data capturing). All data was collected directly onto electronic tablets into the REDCap data management system with built-in skip patterns. Consenting and interviews were conducted in a language of the participant's choice (English, isiZulu, isiXhosa, Sesotho, Setswana, Xitsonga, Tshivenda, Sepedi, siSwati and Afrikaans consent forms and interviews were available). Peer interviewers were responsible for screening for eligibility, consenting and the interviewer-administered survey. Nurses performed a brief additional clinical survey, HIV counselling and testing, and blood sample collection. Samples were sent to a local National Health Laboratory Service (NHLS) laboratory and to the National Institute of Communicable Diseases (NICD) for testing.

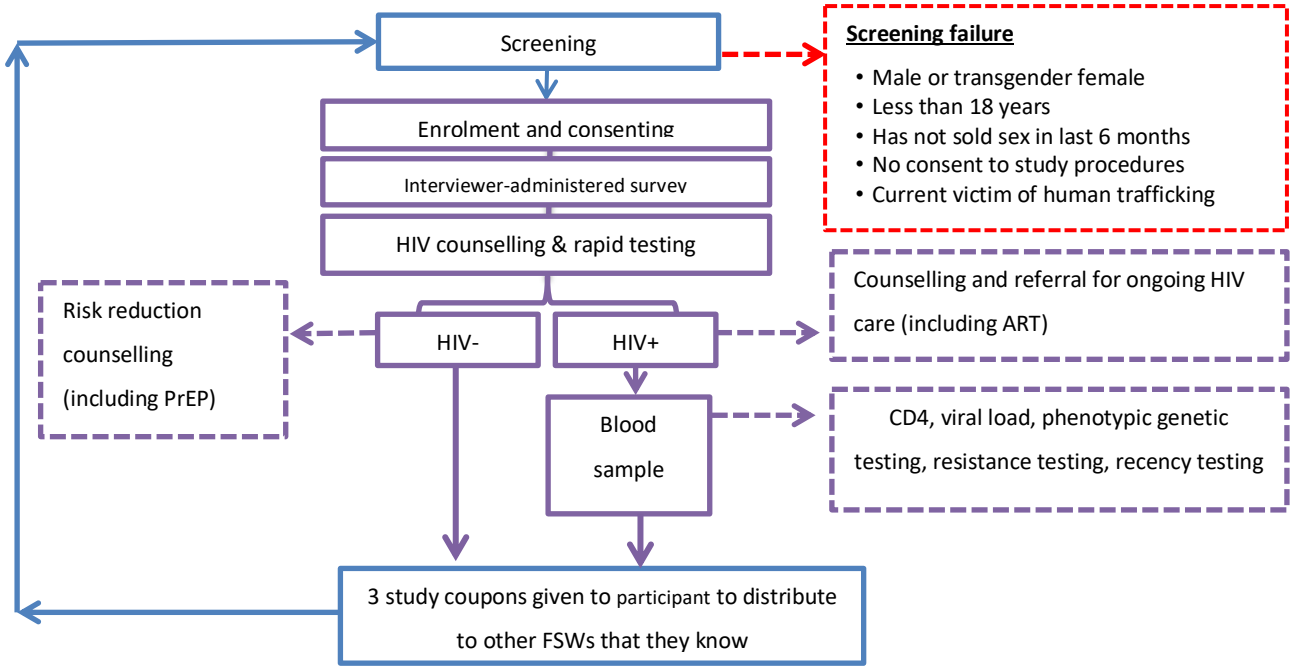

Figure 2: Study data collection procedures at site during primary study

2.2.6 Measures

The primary study included an extensive peer interviewer-administered survey involving multiple measures but only those most relevant to the secondary analysis are discussed below. Table 2 presents measures used in the survey component of the primary study – both the main survey administered by the peer interviewer and the brief clinical survey administered by the nurse. These measures had previously been used in local studies involving FSWs in Soweto and Klerksdorp. Many of the measures were implemented at multiple points in the survey in order to improve the validity of self-report measures. For example, aspects of HIV treatment history were asked twice during the interview (once by the peer interviewer and once by the nurse). See Appendix 4 for screenshots of the REDCap system showing the questions from the survey that are relevant to the secondary analysis.

Table 2: Measures used in interviewer and nurse surveys from primary study

Variable	Measure	Description
Peer interviewer-administered survey		
Demographic information	Demographics form	Includes date of birth, nationality, level of education, age entered sex work
HIV testing and treatment history	HIV knowledge form	Includes previous HIV testing history, current known HIV status, current HIV treatment status, self-report ART adherence
Sex work service uptake	SW services form	Includes use of sex work programme/clinic services in previous 6 months
Nurse-administered survey		
HIV testing and treatment history	Nurse form	Includes current known HIV status, self-report ART history, self-report ART adherence

Table 3 below presents two laboratory measures used in the primary study that are relevant to the secondary analysis, as they measure HIV CoC variables.

Table 3: Measures used in laboratory testing from primary study

Variable	Measure	Description
HIV status	2 x HIV rapid tests	Two rapid HIV fingerprick tests (Abon™ and First Response®) were performed in parallel in the field. If confirmation of discordant rapid tests was required, blood was collected for a laboratory-based HIV enzyme-linked immunosorbent assay (ELISA) to confirm HIV status.
Viral load (VL)	HIV-1 quantitative viral load	Blood was collected for laboratory-based viral load testing. Nucleic acid amplification and quantification of HIV-1 RNA was performed using the COBAS® AmpliPrep/COBAS® TaqMan® HIV-1 Test, v2.0.

2.3 Secondary analysis

2.3.1 Study design

This secondary study is a cross-sectional analysis of all FSWs with HIV enrolled in the primary study.

2.3.2 Study population

The secondary analysis considers a subset of the study population of the primary study, namely biological females, ≧ 18 years of age, who have sold sex in the preceding six months in South Africa, and tested HIV positive during the primary study.

2.3.3 Sampling

1862/3005 participants from the primary study fulfilled the criteria for the secondary analysis. Using this sample size for the secondary analysis allows 90% power to detect a 6% difference in HIV CoC variables between FSWs using sex work programme services and those who do not.

2.3.4 Measurement

New measures were created from the primary study variables for sociodemographic characteristics, HIV CoC and service utilisation (Table 4). The CoC was constructed to directly reflecting the status of the WHO-defined 90:90:90 goals, assessing the proportion of the population of SWs with HIV who knew their status, the proportion of those with a known positive status on antiretroviral treatment (ART) and the proportion of these who were virally suppressed. To note, when survey measures from the primary study were asked by both the peer interviewer and the nurse it was to mitigate the potential impact of report bias, with the assumption that FSWs may have a discordant level of comfort discussing their prior HIV testing or treatment history with a peer interviewer or a nurse (and therefore disclose to the one, but not necessarily to the other). No assumption was made as to whether the peer- or nurse-administered measure was more reliable, but rather than any disclosure of an HIV positive status to either was assumed to indicate prior knowledge of status, even if this was not disclosed to the other questionnaire administrator.

Table 4: Comparison of primary study and secondary analysis variables

Primary study variables	Secondary analysis variable	Description of variable creation or transformation
Age	Age category	Continuous variable coded as a categorical variable, categories based on interquartile ranges: 18-24; 25-34; 35-44; 45+

Age at entry into sex work	Age category at entry into sex work	Continuous variable coded as a categorical variable, categories based on interquartile ranges: 10-17; 18-24; 25+
Years in sex work	Years in sex work category	Continuous variable coded as a categorical variable, categories based on interquartile ranges: 1-2; 3-6; 7-14; 15+
Highest level of education	Completed high school	Categorical variable recoded as incomplete or complete high school: • Incomplete high school ("No schooling"; "Primary school incomplete"; "Primary school complete"; "High school incomplete") • Complete high school ("High school complete"; "Post school qualification")
Place of birth District of recruitment	Migrancy	Categorical variable created as follows: • Local (place of birth in South Africa and district of recruitment in same province) • Internal migrant (place of birth in South Africa and district of recruitment in different province) • Cross-border migrant (place of birth outside South Africa)
HIV status HIV testing history (interviewer) HIV testing history (nurse)	Known HIV positivity	Categorical variable created as follows: • Known HIV positive – HIV status positive and reported previous HIV positive test (interviewer OR nurse survey) • Newly diagnosed HIV positive – HIV status positive and no reported previous HIV positive test
HIV treatment history (interviewer) HIV treatment history (nurse)	ART status	Categorical variable created as follows: • Current ART – reported current ART treatment (interviewer OR nurse survey) • No current ART – reported no previous ART treatment OR stopping/defaulting ART treatment
Viral load	Viral suppression	Continuous variable coded as categorical variable by dichotomising viral load at 1000 copies/ml: • Virally suppressed – viral load <1000 copies/ml • Virally unsuppressed – viral load >1000 copies/ml
N/A	District sex work programme	New variable created based off knowledge of district sex work programmes. Comprehensive HIV services include provision of ART (as opposed to HIV testing and linkage to care). • Established district sex work programme – programme implementing comprehensive HIV services for >6 months • New district sex work programme – programme implementing comprehensive HIV services for <6 months OR still due to begin implementing comprehensive HIV services

Sex work programme services	Sex work programme service categories	Categorical variable recoded 30 specific services used in the past 6 months into seven categories, as follows: • Peer outreach services (seeing a SW peer on outreach; receiving condoms or lubricant; receiving a health talk on outreach) • HIV testing and treatment services (being tested for HIV; being counselled on HIV status or adherence; accessing PrEP or ART; accessing PMTCT) • Sexual and reproductive health services (STI screening or treatment; contraception; cervical cancer screening or pap smears; breast exams) • Other clinical services (TB screening or treatment; treatment of minor ailments; baby wellness checks; vaccinations) • Mental health services (help with mental health problem; help with substance abuse problem; counselling for trauma or tress; general support groups) • Violence services (help with a case of violence or human rights violation; post-rape care; legal assistance) • Financial and social services (seen by a social worker; help with financial planning; help with ID/passport/birth certificate application; help with social grant application; help with opening a bank account; provision of safe space)

2.3.5 Statistical analysis

Only the 1862 participants who tested HIV positive were included in this analysis. Data cleaning and analysis was performed in SAS Enterprise Guide 7.15®. Outliers were identified, and verified or corrected. Preliminary analysis was conducted to assess missing data, though none of the outcome or explanatory variables were missing more than 10% of the data. Categorical variables were assessed by frequencies and proportions. Associations were tested with chi-squared tests. Factors associated with successful viral suppression were determined using a multilevel mixed effects logistic regression model at multivariate level. Selected variables for the model included sociodemographic and service use variables with $p<0.1$ in the bivariate analyses and were adjusted for correlation using the compound symmetry covariance structure. Clustering in the sample was adjusted for by grouping the data according to seed coupon numbers. All participants who were recruited from the seed coupon number were classified in a cluster and this was conducted for all sites. The model was analysed using SAS Enterprise Guide 7.15® using procedure GLIMMIX.

3 Manuscript

This manuscript has been prepared for submission to the Journal of Acquired Immune Deficiency Syndrome (JAIDS). It is formatted according to JAIDS author guidelines (Appendix 2). The role of the authors was as follows: MJ conceptualised the manuscript, oversaw all HIV related data collection (including questionnaire development), analysed the data and wrote the paper. JC was the Principal Investigator for the primary study. NC and JC provided input into the conceptualisation and edited the manuscript. KH co-analysed the data, and KO provided input into the data analysis plan. RJ reviewed the manuscript and advised on the data analysis plan.

The HIV cascade of care and service utilisation at sex work programmes among female sex workers in South Africa

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3.1 Abstract

Background

Female sex workers (FSWs) in South Africa experience uniquely high prevalence of HIV. The National Department of Health (NDoH) has scaled-up specialised programmes to provide needed HIV services. This national cross-sectional study described the HIV cascade of care (CoC) in FSWs in South Africa and explored programme service utilisation impacts on the CoC.

Setting

FSWs were enrolled in 12 district sites across South Africa.

Methods

Participants were recruited by chain-referral, with inclusion criteria being: cisgender female, ≧18 years, and having sold/transacted in sex in the preceding 6 months. All participants with HIV were included in this analysis. Associations between sociodemographic and service utilisation variables and the HIV CoC were assessed. A multivariable regression model determined factors correlated with viral suppression.

Results

1862 FSWs with HIV were enrolled. 92% (1708/1862) were known HIV positive, and 87% (1453/1673) of these currently on antiretroviral treatment (ART). Of those on ART, 74% (1024/1385) were virally suppressed. Age was strongly associated with the CoC, with younger FSWs less likely to be on ART or virally suppressed ($p<0.001$). FSWs using HIV services from specialised programmes were 1.4 times more likely to be virally suppressed (95% CI: 1.1 – 1.9, $p=0.012$) than those not.

Conclusion

The current HIV CoC in FSWs in South Africa approaches achievement of 90:90:90 goals. The evidence affirms specialised sex work programmes, with improved odds of viral suppression in this setting. Younger FSWs show poorer HIV CoC outcomes and require special research and intervention focus.

Key words: HIV cascade of care; sex work; sex work programming, key populations

3.2 Introduction

Female sex workers (FSWs) in South Africa are uniquely affected by HIV infection, with prevalence reported in the range of 40-70% in major cities[1,2]. In recent years, the National Department of Health (NDoH) has focused attention on sex worker (SW) vulnerability to HIV, through the implementation of the National Sex Worker HIV Plan 2016-2019[7]. The plan scaled-up specialised SW friendly health programmes nationally with the aim of achieving the World Health Organization's (WHO) 90:90:90 cascade of care (CoC) targets. This CoC requires 90% of SWs with HIV to know their status, 90% of these to be on antiretroviral treatment (ART), and 90% of these to be virally suppressed[7].

Challenges to the provision of HIV services in SW populations are well-documented, with testing and treatment outcomes inferior to those seen in the general population[10,32]. Stigma has a great effect on SW health-seeking behaviour, with studies worldwide demonstrating a link between experiences and fear of discrimination, particularly from health care workers (HCWs), and lower willingness to engage in health services[12,13,15,16,18,19,33]. Other barriers include monetary and time-based costs to testing and treatment[15,19,33,34], high SW mobility[16], non-disclosure of HIV status to non-paying partners[27], and the prevalence of food and financial insecurity[32]. Sociodemographic factors are also determinants of the HIV CoC, with research in South Africa and other regional countries showing younger FSWs are less likely to be aware of an HIV positive status, to be taking ART, and to be virally suppressed[21,23]. Cross-border migrant SWs in South Africa have also been found to have lower contact with health facilities[22].

There is strong evidence of improved care for SWs through specialised sex work programmes compared to facilities geared towards the general population. Peer-implemented outreach is associated with improved uptake of HIV services[23,39], with this evidence informing the National Sex Worker HIV Plan, which emphasised a peer-led approach[7]. Qualitative research supports SW preference for specialised clinics in which interacting with sensitised staff is enabling[18,34,40,41]. Access may also be facilitated by after-hours and mobile services at sex work hotspots[40–42]. However, the ideal model for HIV service provision to SWs remains undetermined, and the strengths and weakness of current approaches are not fully understood. A recent cluster randomised trial in Zimbabwe tested the expansion of HIV services at sex work clinics (including enhanced PrEP or ART initiation and adherence support). While testing and diagnosis improved between intervention and control arms, there was no significant difference in viral suppression[43].

With these challenges in mind, evidence from a large 2013-2014 survey in three South African major cities found only 57-87% of FSWs with HIV knew their status, and 23-45% of these were

currently taking ART[1]. Similarly, studies in 2015 in Port Elizabeth and in 2016 in Soweto both found 82% of FSWs with HIV knew their status, with ART coverage of 39% and 44% respectively[27,28]. It must be noted that at the time HIV policy in South Africa recommended initiation of ART at lower CD4 counts, and all pre-dated implementation of the National Sex Worker HIV Plan. This study therefore aimed to describe the current state of the HIV CoC in FSWs in South Africa, and to explore potential impacts of sex work programmes on this CoC, after the implementation of the National Sex Worker HIV Plan 2016-2019.

3.3 Methods

3.3.1 Study design and setting

The study was a cross-sectional national survey of FSWs conducted in South Africa in 2019[46]. Study sites were located in 12 districts in the country, across all nine provinces. The study was centrally coordinated with individual sites managed in partnership with organisations running district-level sex work programmes. These programmes differed in some respects (including how long they had been running in each district, and the service package available), but all were implementing programmes in line with the South African National Sex Worker HIV Plan, 2016-2019.

3.3.2 Sampling

The sample size for the study was a minimum of 3000 FSWs nationally. A multi-step sampling process was followed to achieve as representative a study sample as possible[46]. Briefly, a stratified random sample of 12 districts was drawn from the 22 districts in South Africa that had active sex work programmes (ensuring ≧ one district per province). District sample sizes were proportional to FSW population size estimates. All known sex work hotspots in the selected districts were mapped and categorised according to type (e.g. brothel, tavern, hotel, street, truck-stop). A stratified random sample of hotspots was drawn from districts to ensure representation of multiple hotspot types. Seed coupons (a voucher enabling screening) were distributed at each randomly selected hotspot, and thereafter a chain referral method was used. Every participant successfully enrolled into the study was given three coupons to distribute them at random to fellow FSWs who met the inclusion criteria. These were being a cisgender female, ≧18 years, and having sold/transacted in sex in the preceding 6 months. For ethical reasons, being a current victim of human trafficking was an exclusion criteria[46].

3.3.3 Data collection

Data collection took place from February – June 2019. Data was collected directly into the Research Electronic Data Capture (REDCap) system with built-in skip patterns, on electronic tablets. The informed consent process and an interviewer-administered questionnaire were conducted in a language of the participant's choice. Peer interviewers (SWs who underwent upskilling to ensure reliable data collection) were responsible for screening, consenting and main survey administration. Study nurses were responsible for a brief additional clinical survey, HIV testing, and phlebotomy in the case of an HIV indeterminate or positive result. Blood samples were sent to the National Health Laboratory Service (NHLS) and to the National Institute of Communicable Diseases (NICD) for further testing, including viral load.

3.3.4 Measures

Age was measured continuously, and then categorised (18-24; 25-34; 35-44; 45+), as was age at entry into sex work (10-17; 18-24; 25+) and years in sex work (1-2; 3-6; 7-14; 15+) based on interquartile ranges. Participants were questioned about their highest level of education achieved and then categorised as complete or incomplete high school. Place of birth and the district of recruitment were all measured with single items with categorical responses. Migrancy was defined as local if FSWs were working in their birth province, internal migrant if FSWs were South African but not working in their birth province, or cross-border migrant for FSWs born outside of South Africa.

HIV cascade of care variables were measured by the interviewer and nurse surveys, and by clinical tests. HIV status was determined by results of the rapid HIV tests (Abon™, First Response® and Toyo® tests were utilised across sites) performed in the field. HIV testing history was asked in both interviewer- and nurse-administered surveys due to concerns around HIV status disclosure. Responses included no previous HIV test, a previous negative test, a previous positive test, or a previous indeterminate test. Self-reported HIV positive status was created for any reported previous positive result and a positive result during the study. All other HIV positive results during the study was categorised as newly diagnosed. Similarly, HIV treatment history was asked in both surveys. Responses included no previous ART, previous ART but not currently on treatment, or current ART. Self-reported ART status was created for any reported ART and no subsequent stopping. Viral suppression was defined by dichotomising viral load results at 1000 copies/ml, as per South African clinical guidelines.

Sex work programme services were measured by the interviewer-administered survey. All sites had been providing HIV testing and counselling for SWs prior to the study, and a dichotomous variable was created to reflect whether the enrolment district had a well-established sex work programme that had been implementing comprehensive HIV services (including providing ART and PrEP) for at least six months prior to enrolment, or not. Participants selected from 30 specific services they received from sex work programmes in the previous six months. New variables created for this analysis grouped these services into seven categories, as follows: peer outreach (seeing a SW peer on outreach, receiving condoms or lubricant, receiving a health talk on outreach); HIV testing or treatment (being tested for HIV, being counselled on HIV status or adherence, accessing PrEP or ART, accessing PMTCT); sexual and reproductive health (STI screening or treatment, contraception, cervical cancer screening or pap smears, breast exams); "other" clinical services (TB screening or treatment, treatment of minor ailments, baby wellness checks or vaccinations); mental health (help with mental health problem, help with substance abuse problem, counselling for trauma or stress not related to HIV, attending general support groups); violence or human rights violation (help with a case of violence or human rights violation, post-rape care, legal assistance); and financial and social (seen a social worker, help with financial planning, help with ID/passport/birth certificate application, help with social grant application, help with nutritional support, help with opening a bank account, help with a safe space).

3.3.5 Ethical considerations

Ethical approval was granted by the University of Witwatersrand Human Research Ethics Committee (HREC) (Ethics approval 180809). Given the vulnerability of FSWs, and the criminalisation of sex work, ensuring participant safety was paramount. Embedding the study within existing partner organisations enabled ease of referral to further treatment and psychosocial services.

3.3.6 Statistical analysis

Only the 1862 participants who tested HIV positive were included in this analysis. Data cleaning and analysis was performed in SAS Enterprise Guide 7.15®. Outliers were identified, and verified or corrected. Preliminary analysis was conducted to assess missing data, though none of the outcome or explanatory variables were missing more than 10% of the data. Categorical variables were assessed by frequencies and proportions. Associations were tested with chi-squared tests. Factors associated with successful viral suppression were determined using a multilevel mixed effects logistic regression model at multivariate level. Selected variables for the model included

sociodemographic and service use variables with p<0.1 in the bivariate analyses and were adjusted for correlation using the compound symmetry covariance structure. Clustering in the sample was adjusted for by grouping the data according to seed coupon numbers. All participants who were recruited from the seed coupon number were classified in a cluster and this was conducted for all sites. The model was analysed using SAS Enterprise Guide 7.15® using procedure GLIMMIX.

3.4 Results

3.4.1 HIV cascade of care

In total 1862 FSWs with HIV were recruited into the study. Of participants with HIV, 91.7% (1708/1862) self-reported being known positive, while 8.3% (154/1862) were newly diagnosed (Table 5). Of the participants with known HIV positive status, 86.9% (1453/1673) self-reported current ART. Of those taking ART, 73.9% (1024/1385) were virally suppressed.

Table 5: HIV cascade of care among sampled FSWs

HIV cascade of care	Total	
	n	(%)
Known HIV status		
Known positive	1708/1862	(91.7)
Newly diagnosed	154/1862	(8.3)
Self-reported ART		
Currently on ART	1453/1673	(86.9)
Not on treatment	220/1673	(13.2)
Viral suppression		
Suppressed (<1000 copies/ml)	1024/1385	(73.9)
Unsuppressed (>1000 copies/ml)	361/1385	(26.1)

3.4.2 Socio-demographic characteristics and the cascade of care

Out of the total sample of FSWs with HIV, almost half (45.7%, 850/1862) were between 25-34 years old (Table 6). 62.2% (1158/1862) were local, and around one in six (16.3%, 303/1862) were cross-border migrants. The majority (83.3%, 1548/1859) had not completed high school education. Around half (50.7%, 939/1852) of these FSWs with HIV entered sex work above the age of 24, while the other half was younger at entry. Most had either been in sex work for 3-6 years (38.3%,711/1856), or for 7-14 years (30.3%, 562/1856).

Sociodemographic variables were tested for associations with HIV CoC indicators (Table 6). Younger women were less likely to be on ART treatment or virally suppressed. 78.8% (108/137) of FSWs aged 18-24 self-reported taking ART treatment, compared with 89.0% (153/172) of FSWs over the age of 45 ($p<0.001$). Only 58.1% (61/105) of those aged 18-24 years were virally suppressed, compared to 79.3% (429/541) in those aged 35-44, and 86.3% (126/146) in those over 45 years ($p <0.001$). Migration status was also significantly associated with viral suppression, with viral suppression in cross-border migrants at 81.0% (188/232) compared to 77.2% (240/311) in South African internal migrants and 70.8% (596/842) in South African locals ($p=0.002$). FSWs who had completed high school were less likely to know their HIV positive status, with 88.1% (274/311) known positive compared to 92.3% (1431/1548) in those who had not completed school ($p=0.011$). However, those who had completed high school were significantly more likely to be suppressed at 80.4% (180/224) compared to 72.6% (841/1158) in those with incomplete high school ($p=0.016$).

Both age of entry into sex work and years in sex work were associated with differences in cascade of care indicators. Later entry into sex work was associated with higher levels of current ART, with 90.6% (764/843) of those entering over the age of 24 self-reporting ART, compared to 85.6% (155/181) in those entering aged 10-17 and 82.2% (526/640) in those entering aged 18-24 ($p<0.001$). Additionally, more years in sex work was associated with better levels of known positivity and viral suppression. 85.9% (195/227) of those who had spent only 1-2 years in sex work knew their HIV positive status, compared to 95.5% (340/356) in those who had spent 15+ years in sex work ($p=0.001$), and only 68.0% (104/153) of the former group were virally suppressed on ART, compared to 82.6% (237/287) in the latter group ($p=0.001$).

Table 6: Sociodemographic characteristics of FSWs with HIV and associations with HIV CoC

Sociodemographic characteristics	Total*		HIV positive status					Self-reported ART					Viral suppression on ART				
			Known positive		Newly diagnosed		p-value	On ART		Not on ART		p-value	Suppressed		Not suppressed		p-value
	n	(%)	n	(%)	n	(%)		n	(%)	n	(%)		n	(%)	n	(%)	
Age (years)																	
18-24	161/1862	(8,7)	141/161	(87,6)	20/161	(12,4)	0,087	108/137	(78,8)	29/137	(21,2)	**<0.001**	61/105	(58,1)	44/105	(41,9)	**<0.001**
25-34	850/1862	(45,7)	774/850	(91,1)	76/850	(8,9)		632/754	(83,8)	122/754	(16,2)		408/593	(68,8)	185/593	(31,2)	
35-44	667/1862	(35,8)	621/667	(93,1)	46/667	(6,9)		560/610	(91,8)	50/610	(8,2)		429/541	(79,3)	112/541	(20,7)	
45+	184/1862	(9,9)	172/184	(93,5)	12/184	(6,5)		153/172	(89,0)	19/172	(11,1)		126/146	(86,3)	20/146	(13,7)	
Migration																	
Local	1158/1862	(62,2)	1061/1158	(91,6)	97/1158	(8,4)	0,456	889/1041	(85,4)	151/1041	(14,6)	0,066	596/842	(70,8)	246/842	(29,2)	**0,002**
Internal migrant	401/1862	(21,5)	373/401	(93,0)	28/401	(7,0)		325/367	(88,6)	42/367	(11,4)		240/311	(77,2)	71/311	(22,8)	
Cross-border migrant	303/1862	(16,3)	274/303	(90,4)	29/303	(9,6)		239/265	(90,2)	26/265	(9,8)		188/232	(81,0)	44/232	(19,0)	
Education																	
Did not complete high school	1548/1859	(83,3)	1431/1548	(92,3)	117/1548	(7,6)	**0,011**	1209/1400	(86,4)	191/1400	(13,6)	0,197	841/1158	(72,6)	317/1158	(27,4)	**0,016**
Completed high school	311/1859	(16,7)	274/311	(88,1)	37/311	(11,9)		241/270	(89,3)	29/270	(10,7)		180/224	(80,4)	44/224	(19,6)	
Sex work history																	
Age at entry into sex work																	
10-17	198/1852	(10,7)	186/198	(93,9)	12/198	(6,1)	0,458	155/181	(85,6)	26/181	(14,4)	**<0.001**	100/143	(69,9)	43/143	(40,1)	0,059
18-24	715/1852	(38,6)	652/715	(92,2)	63/715	(8,8)		526/640	(82,2)	114/640	(17,8)		355/497	(71,4)	142/497	(28,6)	
25+	939/1852	(50,7)	860/939	(91,6)	79/939	(8,4)		764/843	(90,6)	79/843	(9,4)		565/737	(76,7)	172/737	(23,3)	
Years in sex work																	
1-2	227/1856	(12,2)	195/227	(85,9)	32/227	(14,1)	**0,001**	157/191	(82,2)	34/191	(17,8)	0,134	104/153	(68,0)	49/153	(32,0)	**0,001**
3-6	711/1856	(38,3)	648/711	(91,1)	63/711	(8,9)		544/631	(86,2)	87/631	(13,8)		360/544	(70,6)	150/510	(29,4)	
7-14	562/1856	(30,3)	519/562	(92,4)	43/562	(7,7)		447/509	(87,8)	62/509	(12,2)		320/429	(74,6)	109/429	(25,4)	
15+	356/1856	(19,2)	340/356	(95,5)	16/356	(4,5)		299/336	(89,0)	37/336	(11,0)		237/287	(82,6)	50/287	(17,4)	

*total column is presented by column percentages, associations with HIV CoC indicators are presented by row percentages

Table 7: Sex work programme service use in FSWs with HIV and associations with HIV CoC

Sex work programme services	Total*		Self-report HIV status					Self-report ART status					Viral suppression on ART				
			Known positive		Newly diagnosed		p-value	On ART		Not on ART		p-value	Suppressed		Not suppressed		p-value
	n	(%)	n	(%)	n	(%)		n	(%)	n	(%)		n	(%)	n	(%)	
Site of recruitment																	
>6 months comprehensive HIV services	960/1862	(51,6)	907/960	(94,5)	53/960	(5,5)	**<0.001**	780/888	(87,8)	108/888	(12,2)	0,203	566/746	(75,9)	180/746	(24,1)	0,076
<6 months comprehensive HIV services	902/1862	(48,4)	801/902	(88,8)	101/902	(11,2)		673/785	(85,7)	112/785	(14,3)		458/639	(71,7)	181/639	(28,3)	
Use of peer outreach services																	
Yes	1754/1862	(94,2)	1609/1754	(91,7)	145/1754	(8,3)	0,981	1366/1575	(86,7)	209/1575	(13,3)	0,561	956/1301	(73,5)	345/1301	(26,5)	0,131
No	108/1862	(5,8)	99/108	(91,7)	9/108	(8,3)		87/98	(88,8)	11/98	(11,2)		68/84	(81,0)	16/84	(19,1)	
Use of HIV testing and treatment services																	
Yes	1041/1862	(55,9)	975/1041	(93,7)	66/1041	(6,3)	**0,001**	839/959	(87,5)	120/959	(12,5)	0,372	613/809	(75,8)	196/809	(24,2)	0,065
No	821/1862	(44,1)	733/821	(89,3)	88/821	(10,7)		614/714	(86,0)	100/714	(14,0)		411/576	(71,4)	165/576	(28,7)	
Use of sexual & reproductive health services																	
Yes	833/1862	(44,7)	782/833	(93,9)	51/833	(6,1)	**0,002**	664/770	(86,4)	106/770	(13,8)	0,491	467/628	(74,4)	161/628	(25,6)	0,741
No	1029/1862	(55,3)	926/1029	(90,0)	103/926	(10,0)		789/903	(87,4)	114/903	(12,6)		557/757	(73,6)	200/757	(26,4)	
Use of any other clinical services																	
Yes	302/1862	(16,2)	288/302	(95,4)	14/288	(4,6)	**0,012**	241/280	(86,1)	39/280	(13,9)	0,673	152/226	(67,3)	74/226	(32,7)	**0,012**
No	1560/1862	(83,8)	1420/1560	(91,0)	140/1560	(9,0)		1212/1393	(87,0)	181/1393	(13,0)		872/1159	(75,2)	287/1159	(24,8)	
Use of mental health services																	
Yes	483/1862	(25,9)	456/483	(94,4)	27/483	(5,6)	**0,013**	392/446	(87,9)	54/446	(12,1)	0,447	277/374	(74,1)	97/374	(25,9)	0,947
No	1379/1862	(74,1)	1252/1379	(90,8)	127/1252	(9,2)		1061/1227	(86,5)	166/1227	(13,5)		747/1011	(73,9)	264/1011	(26,1)	
Use of violence & human rights services																	
Yes	352/1862	(18,9)	335/352	(95,2)	17/352	(4,8)	**0,009**	283/328	(86,3)	45/328	(13,7)	0,734	194/267	(72,7)	73/267	(27,3)	0,597
No	1510/1862	(81,1)	1373/1510	(90,9)	137/1510	(9,1)		1170/1345	(87,0)	175/1345	(13,0)		830/1118	(74,2)	288/1118	(25,8)	
Use of other social and financial assistance																	
Yes	253/1862	(13,6)	238/253	(94,1)	15/253	(5,9)	0,146	203/233	(87,1)	30/233	(12,9)	0,894	146/193	(75,7)	47/193	(24,4)	0,559
No	1609/1862	(86,4)	1470/1609	(91,4)	139/1609	(8,6)		1250/1440	(86,8)	190/1440	(13,2)		878/1192	(73,7)	314/1192	(26,3)	
Number of SW programme services used																	
0-1	531/1862	(28,5)	469/531	(88,3)	62/531	(11,7)	**<0.001**	391/457	(85,6)	66/457	(14,4)	0,416	281/370	(76,0)	89/370	(24,1)	0,539
2-3	796/1862	(42,8)	727/796	(91,3)	69/796	(8,7)		628/713	(88,1)	85/713	(11,9)		440/605	(72,7)	165/605	(27,3)	
4+	535/1862	(28,7)	512/535	(95,7)	23/535	(4,3)		434/503	(86,3)	69/503	(13,7)		303/410	(73,9)	107/410	(26,1)	

*total column is presented by column percentages, associations with HIV CoC indicators are presented by row percentages

3.4.3 Sex work programme services and the cascade of care

Half of the sample (51.6%, 960/1862) were recruited in districts that had well-established sex work programmes that had been implementing comprehensive HIV services for over six months (Table 7). The majority of FSWs with HIV had been reached by sex work programmes. Peer outreach was the most common service (94.2%, 1754/1862) reported, while around half of this group reported receiving HIV testing and treatment services (55.9%, 1041/1862). Additional non-HIV services included sexual and reproductive health services (44.7%, 833/1862), mental health services (25.9%, 483/1862), and assistance with violence or human rights violations (18.9%, 352/1862). Overall, around a third (28.5%, 531/1862) of FSWs had accessed 0-1 service category, 42.8% (796/1862) accessed 2-3 service categories, and 28.7% (535/1862) accessed 4+ service categories.

Programme service usage was tested with bivariate analysis for associations with the HIV CoC. FSWs with HIV recruited at a district site with well-established comprehensive HIV services were more likely to know their HIV status at 94.5% (907/960) , compared to those FSWs recruited at sites with new or pending comprehensive services at 88.8% (801/902) ($p<0.001$). Viral suppression was also higher in the former group compared to the latter, at 75.9% (566/746) versus 71.7% (458/639) although this was not statistically significant ($p=0.076$). Use of HIV testing and treatment services was linked to a greater likelihood of known positivity with 93.7% of FSWs with HIV knowing their status compared to 89.3% who did not use these services ($p=0.001$). Additionally, the more sex work programme services a FSW used, the more likely they were to know their HIV status, with 88.3% (469/531) known positive FSWs who used 0-1 service categories, compared to 95.7% (512/535) known positive in those who used 4+ service categories ($p<0.001$).

None of the sex work programme services were significantly associated with differences in reported current ART treatment. Only FSWs with HIV receiving “other clinical” services were significantly associated with lower levels of viral suppression, with 67.3% (152/226) of this group being virally suppressed compared to 75.2% (872/1159) of those not receiving these services ($p=0.012$). 75.8% (613/809) of FSWs with HIV using HIV testing and treatment at sex work programmes were virally suppressed compared to 71.4% (411/576) of those not doing so, but this difference was short of statistical significance ($p=0.065$).

3.4.4 Factors associated with viral suppression

Table 8 presents the results of a multivariable logistic regression to further understand factors associated with viral suppression. Increasing age was very strongly associated with viral suppression. Compared to those in the age category between 18-24 years, those between 25-34 were almost twice as likely to be suppressed (OR=1.7; 95% CI: 1.1-2.7), those between 35-44 almost thrice as likely to be suppressed (OR=2.8; 95% CI: 1.7-4.6), and those above the age of 45 were more than five times as likely to be suppressed (OR=5.3; 95% CI: 2.8-10.1). Cross-border migrants were also more likely to be virally suppressed (OR=1.5; 95% CI: 1.0-2.2), compared to local FSWs.

The use of HIV testing and treatment services at any sex work programme was linked with a greater likelihood of a viral suppression, with FSWs using these services found to be more likely to be suppressed compared to those not using these services (OR=1.4; 95% CI: 1.1-1.9). By contrast, the use of "other clinical" services was associated with reduced likelihood of viral suppression, with FSWs using these services less likely to be suppressed than those not using them (OR=0.6; 95% CI: 0.4-0.8).

Table 8: Factors associated with viral suppression in FSWs with HIV on ART

Variable	Adjusted Odds Ratio	95% Confidence Interval
Age category		
18-24	(ref)	
25-34	1.7	(1.1 - 2.7)
35-44	2.8	(1.7 - 4.6)
45+	5.3	(2.8 - 10.1)
Migration		
Local	(ref)	
Internal migrant	1.2	(0.9 - 1.6)
Cross-border migrant	1.5	(1.0 - 2.2)
Education		
Incomplete high school	(ref)	
Completed high school	1.4	(1.0 - 2.0)
Age at entry into sex work		
10-17	(ref)	
18-24	1.0	(0.7 - 1.5)
25+	0.9	(0.6 - 1.4)
Site of recruitment		
New (<6 months) or pending comprehensive HIV services	(ref)	
Established comprehensive HIV services (>6 months)	1.1	(0.9 - 1.5)
Sex work programme service utilisation		
No HIV testing or treatment	(ref)	
HIV testing and treatment	1.4	(1.1 - 1.9)
No other clinical services	(ref)	
Other clinical services	0.6	(0.4 - 0.8)

3.5 Discussion

This study presents the first national evidence on the HIV cascade in FSWs in South Africa, sampling from all nine provinces. We found an overall HIV prevalence of 62% which confirms previous reports of extremely high HIV prevalence in this population[1]. The HIV cascade of care showed 92% of the total FSWs in our sample knew their HIV positive status, 87% of these self-reported that they were currently on ART, and 74% of those on ART were virally suppressed. These findings on HIV CoC are impressively high, particularly with respect to the first two indicators (known positivity and ART coverage), and show great improvement compared to previous estimates[1,27,28]. The finding that only three quarters of FSWs on ART were virally supressed is significantly lower than among the general population and thus is cause for concern. The reasons for low rates of viral suppression needs to be investigated, and effective interventions implemented to address barriers to adherence in FSWs.

The evidence from this study also affirms the work of sex work programmes and suggests the HIV CoC is significantly improved in the setting of a specialised sex worker programme, particularly with respect to HIV diagnosis. Engagement in multiple service categories (including HIV testing services, sexual and reproductive health services, mental health services, and assistance with violence) was linked to greater levels of known positivity. The more service categories received, the higher the likelihood that a FSW with HIV would know her status. The multivariable logistic regression analysis also demonstrated that receiving HIV testing and treatment services through specialised sex work programmes significantly improved the odds of viral suppression, by 1.4 times, compared to FSWs with HIV who were not receiving these services through a sex work programme.

Our findings also strongly support and reaffirm the need for a special focus on the risk and burden of HIV in adolescent girls and young women (AGYW) who sell sex. Half of the sample began selling sex as AGYW, and FSWs currently falling into the age category of 18-24 years of age had substantially poorer CoC indicators. They were less likely to know their status or to report being on current ART, and crucially, less likely to be virally suppressed. Since fewer years in sex work was also correlated with poorer viral suppression, programmes should consider young, new FSWs as particularly vulnerable to virological failure, and likely to require more intensive treatment support.

One of the major limitations to this analysis is that the study sites were selected based on whether the district housed an existing organisation implementing a sex work programmes. It limits the generalisability of the study to the country as a whole, given districts without active implementing partner organisations were not included. The reach of sex work programmes in our sample was very high, with greater than 90% of FSWs having received at least one service from a sex worker programme within the six months preceding the survey. It is therefore likely that the HIV CoC would be lower in districts without this availability. However, the decision to sample in this fashion was made due to the critical need for local expertise and existing community trust when conducting research into heavily stigmatised and at-risk populations such as FSWs.

Another minor limitation includes that some of the service categories constructed for this analysis are to some degree overlapping – for example, a participant seeing a social worker ("social assistance services") may in fact be receiving counselling for mental health ("mental health services"), or be receiving post-violence care ("assistance with violence services"), or some combination of the above. Additionally, due to funding constraints, self-reported ART responses were not able to be corroborated with laboratory tests such as antiretroviral drug levels. It is possible that ART use was over-reported by participants due to social desirability bias, given the intensive messaging from sex work organisations to advocate for and improve ART uptake. However, it is our opinion that these findings represent real and meaningful shifts in CoC in the FSW population over the past years.

In conclusion, our evidence appears to support that there have been strikingly impressive gains with respect to achieving the WHO 90:90:90 targets amongst FSWs in South Africa in recent years. This is likely aided in considerable part by SW friendly programmes, operating in line with the government's National Sex Worker HIV Plan 2016-2019, and critically important given the criminalisation of sex work and prevalence of discrimination against SWs. The plan is now outdated, and for further progress to be made, should be re-visited. However, successful HIV care requires not just testing and treatment, but must lead to actual viral suppression, and the results from our study indicate this is in much poorer shape than the other CoC indicators. Urgent attention needs to be paid to interventions to support viral suppression, as well as to the unique needs of AGYW sex workers. Additionally, this evidence pre-dates the COVID-19 pandemic, and there is concern that changes to health-seeking behaviour and interruptions to diagnostic and treatment services may have negatively affected CoC indicators. Research to assess the impact of the pandemic on the HIV CoC in SWs and other key populations would be greatly welcomed.

4 Extended results

4.1 Introduction

The extended results section presents a breakdown of the HIV cascade of care by individual district of recruitment. This detail showing variability of CoC indicators between districts was deemed to be predominantly of local interest rather than appropriate for global readership of a scientific journal and was therefore left out of the main manuscript. However, this information may be useful to local policy makers and programme implementers.

4.2 Additional results

Most sites had very high proportions of known positivity with 8/12 sites having greater than 90% of FSWs with HIV knowing their status (Table 9). The highest was 99.0% (100/101) from the Tshwane metropolitan area. By contrast, FSWs from the Vhembe district in Limpopo were least likely to know their HIV status, at 71.6% (68/95), followed by those from the Buffalo City site in the Eastern Cape at 84.7% (144/170).

The proportion of known positive FSWs reporting current ART ranged from as high as 96.0% (71/74) in the Ekurhuleni district and 94.0% (94/100) in Tshwane, to 64.8% (59/80) in the Cape Town metropolitan area. Other areas with low proportions of ART coverage included 77.3% (51/66) of FSWs from Vhembe district, and 74.0% (36/50) from the Frances Baard district in the Northern Cape.

With respect to viral suppression, only two districts demonstrated greater than 80% virally suppressed FSWs on ART, once again the Tshwane metropole at 84.3% (75/89) and the Ekurhuleni district at 82.9% (58/70). FSWs from the Buffalo City metropole in the Eastern Cape were least likely to be virally suppressed on ART at 62.6% (72/115), followed by those from the Ehlanzeni district in Mpumalanga at 69.6% (94/135).

Table 9: HIV cascade of care by district of recruitment

HIV cascade of care	Joh.		Tsh.		Eku.		eThe.		Ugu		CT		Boj.		Ehl.		Buf.		Vhe.		Tha.		Fra.	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Known HIV status																								
Known positive	347/376	(92,3)	100/101	(99,0)	77/86	(89,5)	292/301	(97,0)	63/65	(96,9)	91/96	(94,8)	168/190	(88,4)	173/188	(92,0)	144/170	(84,7)	68/95	(71,6)	132/139	(95,0)	53/55	(96,4)
Newly diagnosed	29/376	(7,7)	1/101	(1,0)	9/86	(10,5)	9/301	(3,0)	2/65	(3,1)	5/96	(5,2)	22/190	(11,6)	15/188	(8,0)	26/170	(15,3)	27/95	(28,4)	7/139	(5,0)	2/55	(3,6)
Self-reported ART																								
Currently on ART	294/342	(86,0)	94/100	(94,0)	71/74	(96,0)	262/292	(89,7)	59/63	(93,7)	59/80	(64,8)	148/166	(89,2)	145/172	(84,3)	120/136	(88,2)	51/66	(77,3)	113/132	(85,6)	36/50	(74,0)
Not on treatment	48/342	(14,0)	6/100	(6,0)	3/74	(4,0)	30/292	(10,3)	4/63	(6,4)	21/80	(26,3)	18/166	(10,8)	27/172	(15,7)	16/136	(11,8)	15/66	(22,7)	19/132	(14,4)	13/50	(26,0)
Viral suppression																								
Suppressed	218/288	(75,7)	75/89	(84,3)	58/70	(82,9)	184/258	(71,3)	41/55	(74,6)	31/41	(75,6)	113/145	(77,9)	94/135	(69,6)	72/115	(62,6)	33/47	(70,2)	80/107	(74,8)	25/35	(71,4)
Unsuppressed	70/288	(24,3)	14/89	(15,7)	12/70	(17,1)	74/258	(28,7)	14/55	(25,5)	10/41	(24,4)	32/145	(22,1)	41/135	(30,4)	43/115	(37,4)	14/47	(29,8)	27/107	(25,2)	10/35	(28,6)

Joh. City of Johannesburg

Tsh. City of Tshwane

Eku. Ekurhuleni District

eThe. City of eThekwini

Ugu Ugu District

CT City of Cape Town

Boj. Bojanala District

Ehl. Ehlanzeni District

Buf. Buffalo City

Vhe. Vhembe District

Tha. Thabo Mofutsanyane District

Fra. Frances Baard District

5 Conclusions and recommendations

5.1 Conclusions

This study presents the first evidence on the HIV cascade of care in FSWs, including data from all nine provinces in South Africa. It finds great improvement in HIV CoC indicators from previous studies, with total known positivity and ART coverage both effectively meeting WHO 90:90:90 goals, a huge achievement given the well-established challenges in providing HIV testing and treatment services in FSWs. It does demonstrate a clear lag with respect to viral suppression across the sample, which is an area worthy of further research and implementation attention. There was also variability in the CoC indicators across the 12 sites, with the best results found in the large urban centres, particularly in Gauteng. More peripheral or rural districts demonstrated greater shortfalls in the CoC, such as the sites in the Eastern Cape, Mpumalanga and Limpopo.

This study also explored several sociodemographic factors associated with CoC outcomes, and reaffirms the need for a special focus on HIV risk and care in younger FSWs, as has been suggested by other studies across the world.[21] FSWs who fell into the 18-24 year age category were less likely to be virally suppressed in both bivariate and multivariable analysis. Since fewer years in sex work was also correlated with poorer viral suppression, this adds to the body of evidence that AGYW newly entered into sex work represent an extremely high risk subset of this population.[21,23]

This evidence shows that the HIV CoC in FSWs in South Africa has improved markedly in the context of the National Sex Work HIV Plan 2016-2019[7], and provides supporting evidence that HIV services delivered through sex work programmes improves HIV CoC outcomes, including viral suppression. This suggests that HIV care in FSWs is improved in the context of specialised programmes with peer-led or implemented services, and should encourage ongoing commitment to this approach in this population.

It must be noted that these findings pre-date the COVID-19 pandemic, and there is evidence to suggest the pandemic has had strong negative impacts on the health of key populations (including SWs).[47] These impacts include difficulty or loss of access to HIV testing and treatment services, and include interruptions to ART.[47] These impacts negatively affect all elements of the HIV CoC, with potentially fewer HIV diagnoses, ART initiations, and loss of viral suppression. It is also possible that job losses and increased economic hardship as a result of the pandemic may cause more women to enter sex work. There is therefore a real likelihood that some of the impressive

gains demonstrated in this study may no longer reflect the reality of the HIV CoC in FSWs in South Africa at present.

5.2 Recommendations

5.2.1 Policy recommendations

This study presented a unique opportunity to assess the contribution of sex work programmes rolled out under the National Sex Work Plan HIV Plan 2016-2019, to the HIV CoC. The findings affirm the work of sex work programmes and suggests the HIV CoC is improved in the setting of a specialised sex worker programme.

At the time of this study, only 22 out of the 52 districts in the country had active sex work programmes. Although the need is not equal across all regions, there are likely districts that would still benefit greatly from such programmes, particularly if this guided by up-to-date data on sex worker population size estimates. One of the district sites (in the Northern Cape) was still a pilot programme at the time of the study, and has subsequently closed down. The results of this analysis showed that all HIV CoC indicators were highest in the large urban centres, particularly in Gauteng which has the longest established and highest density of sex work clinics in the country, and suggests a need to further grow and support programmes operating in more peripheral or rural districts.

The development and implementation of the National Sex Work HIV Plan 2016-2019 provided significant impetus and funding to enable the expansion of these programmes, and was launched with high-level political support by the deputy president of the country. This plan is now unfortunately out of date, and the absence of any current plan is a serious threat to maintaining momentum in the gains in SW HIV care that have been demonstrated in this study. The development of an updated plan could solidify these gains, but also build on them, as is urgently required to address the impact of recent developments, such as the COVID-19 pandemic, and to guide innovation in tackling the demonstrated shortfalls in the current CoC. As this study shows, we need evidence-based strategies to address viral suppression in SWs, and to consider implementation of programmes in non-urban centres and districts without existing SW services. A renewal of the National Sex Work HIV Plan should take into account these and other recent findings from research into HIV in SW populations.

Finally, there is evidence to suggest that implementing comprehensive health services as opposed to exclusively HIV services, in addition to any intrinsic value, is also beneficial for HIV CoC outcomes. The use of multiple service categories was associated with better likelihood of an FSW

knowing their HIV positive status, suggesting offering a variety of services may act as a useful entry point for many FSWs into the HIV care continuum. Programme planning tends to prioritise the benefits of HIV testing and treatment alone, but the lived experience of many FSWs includes other varied and pressing health and social needs. It is critical to note that focusing on HIV services to the exclusion of these other needs not only under-addresses concerns such as broader reproductive health, mental health and chronic stress, but also contributes to a stigmatising view of SWs as being "vectors of disease".[38] Providing a holistic package of services remedies this, and it is only an additional benefit that this evidence suggests that comprehensive services may also improve the HIV care continuum. This holistic approach should form part of a broadly enabling policy environment to address health among FSWs, that includes other levers for change, such as law reform and decriminalisation.

5.2.2 Programme recommendations

From a programme perspective, the most important finding of this study is that it once again highlights the worse HIV CoC outcomes found in that younger FSWs between the ages of 18-24. Similarly, outcomes are worse in those who entered sex work at younger ages. Programmes need to pay particular attention to the overlap between AGYW and FSW populations. Service offerings need to be tailored to the unique needs of this age group who often fall through the programmatic gaps between AGYW and SW projects.

Secondly, the extent to which viral suppression lags behind the other CoC indicators across the sample is cause for serious concern. The importance of ongoing treatment and adherence support and appropriate viral load monitoring and regimen-switching in a programme setting cannot be overstated, especially in the context of scale-up of programmes implementing "test and treat" approaches to HIV care.

Finally, it may be worthwhile to take note of differing levels of uptake of the various service categories across the sample. It is clear that FSW peer outreach services have substantial coverage across South Africa, likely due to the peer-implemented model advocated for by the National Sex Work HIV plan. HIV services and sexual and reproductive health services more broadly were also widely used across the sample. However, other psychosocial services were comparatively less accessed, such as mental health services or assistance with violence or human rights violations. It is not likely that this is only reflective of the need for these services in FSW communities, in which mental illness and violence exposure is extremely high, but also that programmes often emphasise clinical interventions over psychosocial services. The capacity for programmes to address these needs, within resource limitations, is worth consideration.

5.2.3 Further research recommendations

There is still a great need for implementation research into optimal models for HIV programming in the sex work population. As viral suppression has been noted as a key concern, with a substantial lag behind the other HIV CoC outcomes, innovative approaches to improving viral suppression in FSWs is urgently needed. In particular, detailed data on retention in care and adherence to ART was not collected in this survey, especially in the form of objective measures such as clinic appointment visits and antiretroviral drug levels. More extensive long-term research on the barriers and enablers of adherence to ART in FSWs would provide crucial guidance on what services would support this aspect of the CoC.

The finding that the use of "other clinical" services was associated with reduced odds of viral suppression is not easy to interpret and further research into this finding is warranted. It may reflect a greater need for extra clinical services by FSWs who are unwell, but this would need to be further explored. Another relevant limitation includes that some of the service categories constructed for this analysis are to some degree overlapping – for example, a participant seeing a social worker ("social assistance services") may in fact be receiving counselling for mental health ("mental health services"), or be receiving post-violence care ("assistance with violence services"), or some combination of the above. Additionally, this study provided only cross-sectional data, which has limited capacity to assess the ongoing impact of service provision on HIV CoC outcomes in FSWs, in the context of a changing HIV policy and programming environment. Longitudinal cohort studies would be hugely beneficial in assessing risk factors for poor HIV CoC outcomes, as well as the impact of various HIV prevention and care interventions, such as the roll-out of PrEP, HIV self-testing, and new first-line ART regimens.

Finally, research is needed to assess the impact of the COVID-19 pandemic on HIV prevention and care in SWs in South Africa, and particularly whether the HIV CoC has been adversely effected.

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7 Appendices

7.1 Appendix 1 – University of Witwatersrand Plagiarism form

PLAGIARISM DECLARATION TO BE SIGNED BY ALL HIGHER DEGREE STUDENTS

I Maya Jaffer (Student number: 1922750) am a student registered for the degree of Master's in Public Health in the academic year 2021.

I hereby declare the following:

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- I have followed the required conventions in referencing the thoughts and ideas of others.
- I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my own unaided work or that I have failed to acknowledge the source of the ideas or words in my writing.
- I have included as an appendix a report from "Turnitin" (or other approved plagiarism detection) software indicating the level of plagiarism in my research document.

Signature: _____ Date: 30 April 2021

7.2 Appendix 2 – Journal guidelines for authors

JAIDS: Journal of Acquired Immune Deficiency Syndromes

Online Submission and Review System

Author Resources

Instructions for Authors (this page)

Reprint Ordering

Permissions Requests

Reprints

SCOPE

JAIDS: Journal of Acquired Immune Deficiency Syndromes is a peer-reviewed, multidisciplinary journal directed to an audience of physicians and researchers. The journal publishes original work in the form of Original Articles, Rapid Communications, Brief Reports, and Letters to the Editor. *JAIDS* does not publish case reports.

MANUSCRIPT SUBMISSION

A submitted manuscript must be an original contribution not previously published (except as an abstract or preliminary report), must not be under consideration for publication elsewhere, and, if accepted, must not be published elsewhere in similar form, in any language, without the consent of Lippincott Williams & Wilkins. Each person listed as an author is expected to have participated in the study to a significant extent. Although the editors and referees make every effort to ensure the validity of published manuscripts, the final responsibility rests with the authors, not with the journal, its editors, or the publisher.

All submissions will be rigorously peer-reviewed by members of the Editorial Board and by other specially qualified individuals as well. In the interests of rapid reviewing of contributions, only one of the Editors-in-Chief will, in general, make the final determination as to the acceptability of a submission, after collecting the referee's comments. Contributors may recommend specific names of reviewers from the Editorial Board, as well as other individuals they deem especially well qualified. However, the Editors-in-Chief will not be bound to follow such suggestions.

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Manuscripts that do not adhere to the following instructions will be returned to the corresponding author for technical revision before undergoing peer review.

ARTICLE LIMITATIONS – BEGINNING WITH October 27, 2016 SUBMISSIONS:

Article type	Limitations	Abstracts
Original Articles	3500 words + 5 figures/tables - if more then use Supplemental Digital Content	Structured; 250 words
Rapid Communications	2000 words + 2 figures/tables	Structured; 250 words
Brief Reports	2000 words + 2 figures/tables	Structured; 250 words
Letter to the Editor *(published online only)*	1500 words; 1 figure/table	none

*If a figure/table is more than one page it will count for multiple figures (ie: if 1 figure totals 2 pages it will count as 2 figures; if 1 figure takes 3 page, it will total 3 figures, etc.)

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Letters to the Editor can provide additional comment on an article published in *JAIDS*, or can be a very concise report on study findings. Letters should be no more than 1500 words and 1 figure/table. **Letters to the Editor will be published ONLINE ONLY.**

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Manuscript files must be uploaded into the Editorial Manager online interface. Most word-processing file formats are acceptable. Editorial Manager will then create PDF files of the authors' submission, and the author must view and approve the files before they will be submitted to the editorial office. Please be sure that the manuscript file contains complete text for your submission (title page and abstract), as this is the file that will be downloaded by the reviewers and publisher. Please see the sections below for instructions regarding Figure and Table files.

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1. Schambelan M, Benson CA, Carr A, et al. Management of metabolic complications associated with antiretroviral therapy for HIV-1 infection: recommendations of an International AIDS Society-USA panel. *J Acquir Immune Defic Syndr.* 2002;31:257–275.

Book Chapter

2. Wortmann RL, Bentzel CJ. Renal handling of uric acid. In: Massry SG, Glassock RJ, eds. *Massry and Glassock's Textbook of Nephrology*. Phiadelphia: Lippincott Williams & Wilkins, 2001;90–92.

Entire Book

3. Mandell GL, Mildvan D, eds. *Atlas of AIDS*. 3rd ed. Philadelphia: Lippincott Williams & Wilkins; 2001.

Software

4. Epi Info [computer program]. Version 6. Atlanta: Centers for Disease Control and Prevention, 1994.

Online Journals

5. Friedman SA. Preeclampsia: a review of the role of prostaglandins. *Obstet Gynecol* [serial online]. January 1988;71:22–37. Available from: BRS Information Technologies, McLean, VA. Accessed December 15, 1990.

Database

6. CANCERNET-PDQ [database online]. Bethesda, MD: National Cancer Institute, 1996. Updated March 29, 1996.

World Wide Web

7. Panel on Clinical Practices for the Treatment of HIV Infection. Guidelines for the use of antiretroviral agents in HIV-infected adults and adolescents. Department of Health and Human Services and Henry J. Kaiser Foundation, January 28, 2000. Available at: http://www.hivatis.org/guidelines/AA599.pdf.

Paper Presented at a Conference

8. Koenig L, Ellerbrock T, Pratt-Palmire M, et al. Prospective predictors of medication adherence: a study of the first six months of highly active antiretroviral therapy (HAART) using electronic monitoring [WePeB5818]. Presented at: XIV International AIDS Conference; 2002; Barcelona.

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FAQ for open access

http://links.lww.com/LWW-ES/A48

7.3 Appendix 3 - Ethics clearance certificate

INDEPENDENT ETHICS COMMITTEE APPROVAL FORM

Ethics Reference No.	**180809**	**Date of Meeting**	31-Aug-2018
		Recertification Due	30 August 2019 (If applicable)

Principal Investigators:	Ms J Coetzee	**Investigators:**	Dr M Jaffer
			Dr AWA Kinghorn
			Prof NA Martinson
			Ms MS Milovanovic
			Mr K Otwombe

Protocol Title:	**Modelling HIV & Associated Factors amongst Sex Workers in South Africa**

DOCUMENTS REVIEWED			**Tick As Appropriate**	**Yes**	**No**
Protocol Number	**SW-SIB**	**Date:**	01-Sep-2018		
Protocol	Protocol: NIFAHI-FSW02, Version 1.0 - WITHDRAWN	**Date:**	01-Aug-2018	☑	☐
	Protocol: SW-SIB, Version 2.0	**Date:**	01-Sep-2018	☑	☐
Investigator's Brochure	N/A - Version: N/A - Dated:			☑	☐
Subject Information/Consent Form	Participant Information Leaflet and Informed Consent Form - Version: 1.0 - Dated: 01 Sep 2018			☑	☐
	Data Collection Flow Chart - Version: - - Dated:			☑	☐
Advertisements	Draft Coupon - Version: - - Dated:			☑	☐
Questionnaires	Study Questionnaire - Version: - - Dated: 02 Aug 2018			☑	☐
Insurance/Compensation	N/A	Valid From	To:	☐	☑
Synopsis of Study/Trial Summary	National Sex Work Study			☑	☐
Other Documentation	Protocol Synopsis - Dated: 01 Aug 2018			☑	☐
	HREC Application Form - Dated: 07 Aug 2018			☑	☐
	NHREC Trial Application ID#5095 - Dated: 06 Aug 2018			☑	☐
Relevant Trial Hospital/(s)	Chris Hani Baragwanath Hospital			☑	☐
Syndicate and/or Research Unit	Peri-Natal HIV Research Unit - PHRU			☑	☐

DETAILS OF COMMITTEE	
Name	University of the Witwatersrand Human Research Ethics Committee (Medical)
Address	Research Office, Senate House University of the Witwatersrand, 1 Jan Smuts Avenue, BRAAMFONTEIN, Johannesburg, 2000

DETAILS OF MEETING	**Yes**	**No**
Is the Investigator a member of the committee ?	☐	☑
If "Yes" did he/she vote ?	☐	☑
Is the Committee organised and operated according to applicable laws and regulations together with ?	☑	☐
Local GCP requirements ?	☑	☐
ICH GCP requirements ?	☑	☐
FDA GCP requirements ? FWA Registered No. IRB00001223	☑	☐
Progress reports required either in March and September or six monthly from start of study ?	☑	☐

DECISION ON APPROVAL : Is approval given to conduct the trial ?		**Tick As Appropriate**
Yes - with no conditions		☑
Remarks :	Our expectation is that our requirements are fulfulled once a company has submitted and uploaded relevant approvals onto NHRD.	
Yes - with conditions		☐
Specify conditions :		
No		☐
Specify reasons		

Page 1 of 2

7.4 Appendix 4 – REDCap screenshots of relevant parts of questionnaire

HIV KNOWLEDGE (ENGLISH)

Have you previously tested for HIV?

◯ No ◯ Yes

What was your test result?

◯ I do not know ◯ Negative ◯ Positive ◯ Indeterminate

How old were you when you were diagnosed with HIV?

_____

Are you on treatment?
(IF "YES" TO PMTCT, THEN HAS TAKEN TREATMENT)

◯ No, I have never taken treatment ◯ No, I stopped taking treatment ◯ Yes, I am on treatment always

In the past week how many times have you taken your treatment?

◯ All 7 days ◯ 5-6 days ◯ 3-4 days ◯ 1-2 days ◯ Not at all

Please rate your adherence to treatment in the past 4 week.

Non adherent 100% adherence

(Place a mark on the scale above)

FINAL (ENGLISH)

In the past 6 months, what services have you received from a sex work specific project?

☐ seen a SW-peer on outreach ☐ been given condoms ☐ received a health talk ☐ received help with a case of violence or a human rights violation ☐ counselling or support group services for HIV status
☐ counselling or support services for mental health, trauma, or stress (so not HIV related)
☐ Mammograms ☐ Baby wellness ☐ PMTCT ☐ STI screening ☐ Family planning
☐ Pap smears ☐ Childhood immunisations ☐ Substance abuse ☐ Mental health ☐ Counselling for financial planning ☐ Social worker ☐ Help with ID/birth certificate/passport other identifying documents
☐ Help with access to social grants ☐ Help with opening a bank account ☐ Nutrition support
☐ Support groups ☐ General minor ailments ☐ Safe space unrelated to HIV and sex work
☐ Rape or post trauma care ☐ Legal assistance ☐ HIV testing ☐ Support groups ☐ ART/PrEP access
☐ STI treatment ☐ TB treatment ☐ none of the above, I haven't been helped by a sex work project yet

If you needed to go to the clinic, what clinic hours would suit you?

☐ Day ☐ Night

What 3 days of the week most suit you to go to the clinic?

☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday ☐ Friday ☐ Saturday ☐ Sunday

In an ideal situation, what are all the services that you would like to receive at the clinic (read all and mark those that apply)

☐ seen a SW-peer on outreach ☐ been given condoms ☐ received a health talk ☐ received help with a case of violence or a human rights violation ☐ counselling or support group services for HIV status
☐ counselling or support services for mental health, trauma, or stress (so not HIV related)
☐ Mammograms ☐ Baby wellness ☐ PMTCT ☐ STI screening ☐ Family planning
☐ Pap smears ☐ Childhood immunisations ☐ Substance abuse ☐ Mental health ☐ Counselling for financial planning ☐ Social worker ☐ Help with ID/birth certificate/passport other identifying documents
☐ Help with access to social grants ☐ Help with opening a bank account ☐ Nutrition support
☐ Support groups ☐ General minor ailments ☐ Safe space unrelated to HIV and sex work
☐ Rape or post trauma care ☐ Legal assistance ☐ HIV testing ☐ Support groups ☐ ART/PrEP access
☐ STI treatment ☐ TB treatment ☐ none I don't want to engage with a sex worker project

ART HISTORY

Can you confirm what your previous HIV test result was, before today?

◯ HIV negative
◯ HIV positive
◯ Indeterminate (they could not tell me the result)
◯ I have really never tested for HIV before today

Can you confirm the date of this PREVIOUS HIV test please _____

Just to confirm, have you EVER previously taken treatment / ART (This can include clinic based ART initiation, or PMTCT during a pregnancy or labour, or other)

◯ Yes ◯ No

When was the first time that you ever started taking treatment?
(If month and day unknown, insert 01-01-[YEAR])

_____

Are you still taking any ART or have you stopped taking them?

◯ still taking
◯ stopped all ART

When did you stop taking your ART?
(IF month and day unknown, insert 01-01-[YEAR])

_____

7.5 Appendix 5 - Turnitin report

I have checked report 

1922750:MPH_Research_Report_(no_appendices)_-_Maya_Jaffer_1922750.pdf

ORIGINALITY REPORT

12%	10%	7%	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

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6	qmro.qmul.ac.uk Internet Source	<1%
7	www.aids2018.org Internet Source	<1%

7.6 Appendix 6 - Letter stating contribution of candidate to the manuscript

To whomever it may concern,

This letter serves to confirm that Maya Jaffer (student number 1922750) will be submitting a drafted manuscript entitled "The HIV cascade of care and service utilisation at sex work programmes among female sex workers in South Africa", as part of her research report for a Master's in Public Health at the University of the Witwatersrand.

This manuscript is derived from work done on the SW-SIB sex worker study (HREC 180809) conducted by the Perinatal HIV Research Unit (PHRU) in 2019, with support and funding from the South African Medical Research Council (SAMRC). Maya Jaffer was the clinical sub-investigator on the core study team that designed and implemented the study.

Under the guidance of her supervisors, Nicola Christofides and Jenny Coetzee, Maya Jaffer conceptualised this research question, performed the data analysis (with the assistance of the statistics team at the PHRU) and wrote the initial draft of the manuscript in its entirety.

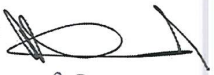
Yours sincerely,

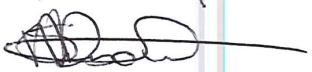
Name: Rachel Jewkes Signature: 

Name: Minja Milovanovic Signature: 

Name: Kennedy Otwombe Signature: 

Name: Khuthadzo Hlongwane Signature: 

Name: Mokgadi Matuludi Signature: 

Name: Venice Mbowane Signature: 

Name: Nicola Christofides Signature: 

Name: Jenny Coetzee Signature: